THE

# MECHANICS' MAGAZINE.

JULY 1st—DECEMBER 30th, 1854.

EDITED BY R. A. BROOMAN.

VOL. LXI.

" Bold Science, kindling her immortal lights,
Passeth among the peoples."



LONDON:
ROBERTSON, BROOMAN, AND CO.
Mechanics' Magazine Office,
166, FLEET-SRTEET.
AGENTS:—*EDINBURGH*, J. SUTHERLAND; *GLASGOW*, W. R. M'PHUN, AND DAVID ROBERTSON; *DUBLIN*, MACHIN AND CO., 8, D'OLIER-STREET; *PARIS*, A & W. GALIGNANI, RUE VIVIENNE; *HAMBURGH*, W CAMPBELL.

1854.

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## TO THE SIXTY-FIRST VOLUME.

# Mechanics' Magazine.

No. 1612.] SATURDAY, JULY 1, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## GREEN'S PATENT IMPROVEMENTS IN BOILERS AND FURNACES.

Fig. 1.

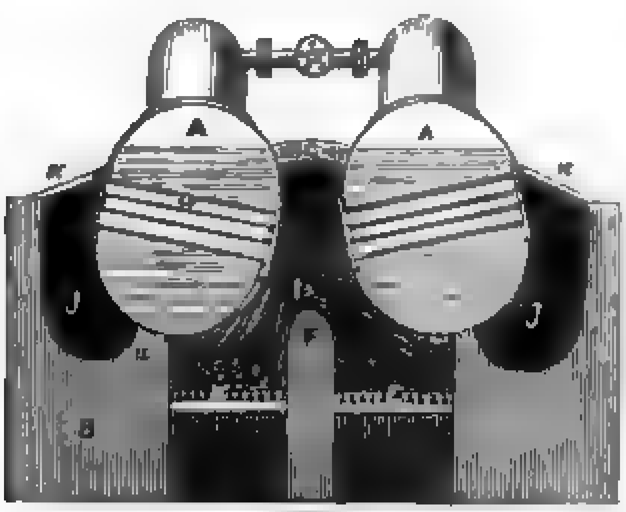


Fig. 2

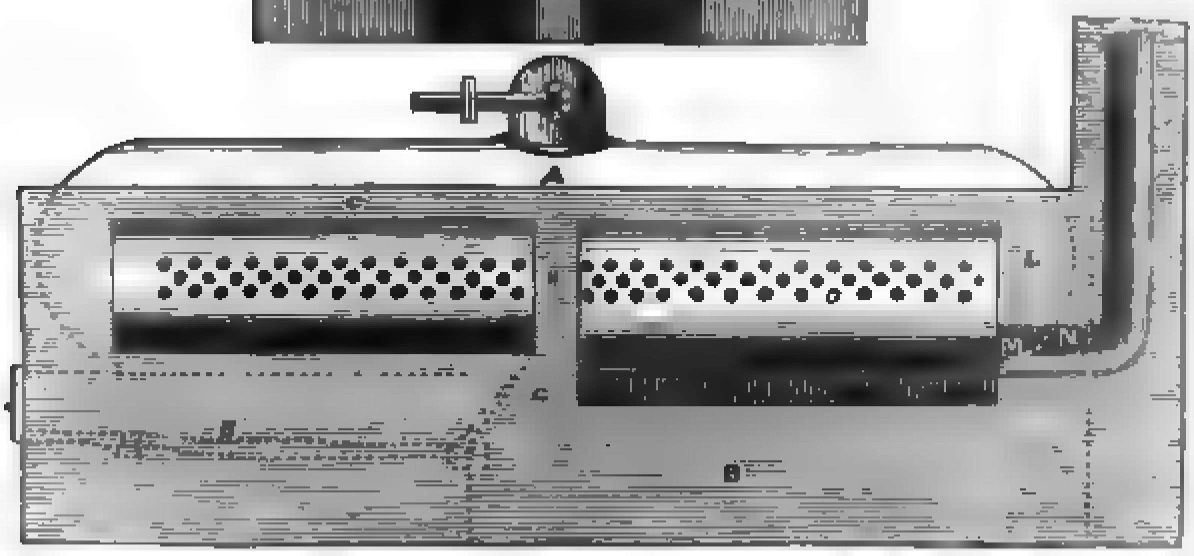
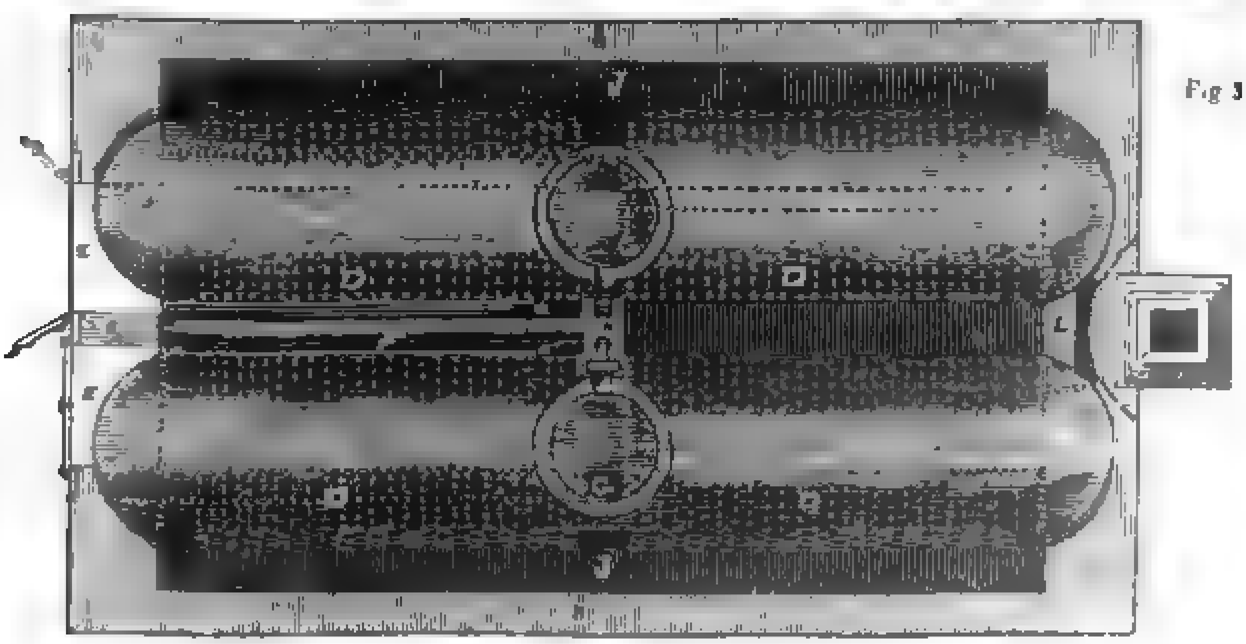


Fig. 3



## GREEN'S PATENT IMPROVEMENTS IN BOILERS AND FURNACES.

(Patent dated December 10, 1853.)

MR. GREEN, an experienced engineer of Wakefield, has patented a method of constructing and arranging boilers and furnaces for the purpose of economizing the use of fuel and preventing the emission of smoke. In carrying his invention into effect, he makes use of one or of two boilers, fixing therein rows of tubes, which run from side to side, or across their lengths. When one boiler only is used, he employs a single furnace, and when two boilers are used, he employs either a single fire or two fires, which are separated by means of a partition of brickwork or other materials, carried up about two or three feet from the surface of the fire-bars. Between the top of this partition and the top of the furnace, and also between the two boilers, there is a space which forms a combustion-chamber, and in which the products from the two fires (which are fed alternately) unite, and then traverse the tubes to and fro in the boilers, after which the products of combustion which may remain unconsumed pass underneath the boilers, and from thence to the chimney through flues provided for that purpose. In some cases the inventor applies the combustion-chamber to plain boilers without tubes. Two boilers and two fires are used, and the combustion-chamber is formed between the two boilers by means of a partition or partitions of brickwork or other material, and through this chamber the products of combustion pass alongside or between the two boilers, and then return across and underneath the boilers into the side flues at the further end, and from thence pass to the chimney.

Fig. 1 of the engravings in the preceding page is a transverse section; fig. 2, a longitudinal section; and fig. 3 a plan of a pair of steam boilers and furnaces constructed and arranged according to this invention. A A are the two boilers, set side by side, and B B is the brickwork bed on which they are supported, the bottoms of the boilers resting on the bed at *a a* throughout their length, and on the cross walls at the middle and at each end. C is a brickwork or other arch, covering in the space between the boilers, and placed so as to be below the water-line. D D are the transverse tubes, the number of rows of which may be varied, as may also the inclination at which they are placed. E E are the two furnaces, and F is the partition between them; G G are the furnace-bridges, which are built up to the bottoms of the boilers; and H is a partition rising from the bridges up to the arch, C. The space, I, which extends back as far as the partition, H, forms the combustion-chamber. J J are the side flues, which are not formed entirely of brickwork, but are covered in by flaps or doors, K K, hinged to the sides of the boilers, and resting on the stone, fire-brick, or quarry copings of the brickwork at each side. These flaps or doors are for the purpose of facilitating the cleaning out of the tubes. L is a stop or partition at the further end of the boilers, which closes the flue formed by the space between them and behind the partition, H, with the exception of a passage, M, through which the products of combustion pass to the chimney flue, N. If desired, this stop or partition may be dispensed with. The furnaces, E E, are stoked alternately, one of them being supplied with fuel while the other is in a state of bright ignition. By this means the carbonaceous matter and inflammable gases contained in the smoke arising from the one furnace, and entering the combustion-chamber, are consumed there by the flame from the other furnace. The united products from the two furnaces pass from the combustion-chamber, through the transverse tubes with which that chamber is in communication, then traverse the side flues, pass from them through the transverse tubes behind the partition, H, into the space between the boilers, and then through the passage, M, to the chimney-flue, N, as indicated by the arrows.

## ON ORNAMENTAL AND OTHER WOODS*.

THE term *wood* is commonly applied to those portions of the vegetable axis that are sufficiently hard to offer considerable resistance and solidity, so as to be used for purposes requiring various degrees of firmness and strength. Every flowering plant is composed of an axis, and the appendages of the axis; the former consisting of the stem and root, the latter of the leaves and flowers. In trees, shrubs, and under-shrubs, the axis is said to be *woody*; in herbs it is termed *herbaceous*. In the former the stems are permanent, and do not die to the ground

* From an excellent article on "Wood," in the last published part of "Tomlinson's Cyclopædia of Useful Arts," partly abridged from papers by Professor Forbes.

annually, as is the habit of the latter. A shrub, a tree, an under-shrub, a bush, are merely gradations of magnitude in perennial plants; woods valuable for purposes of art and manufacture are derived from all of them. But as bulk and dimensions are necessary to make timber available for extensive use, by far the greater part of our ornamental woods are derived from trees. There are, however, some remarkable exceptions. The wood of roots is different in structure from the wood of stems, and the same tree may furnish two very different kinds of ornamental wood, according as they are derived from its ascending or its descending axis. The wood of the inner portions of a stem may be of very different colour and quality from that of its outer parts. In the immediate neighbourhood of the origin of branches, it may exhibit varieties of pattern, such as to render it greatly more ornamental than elsewhere, and in some cases, when under the influence of morbid growth, reveal additional beauties, so as to be prized for qualities which in nature are defects. If we take a number of transverse sections of wood, and compare them one with another, it will soon become evident that there are two principal types or modifications of structure. Compare a cross cutting of oak or plane with a like portion of "Palmyra" wood, and you will see the differences between them strongly contrasted. In the former, the layers of wood are ranged in concentric circles round the central pith, and are encased externally in a binding of bark, itself composed of distinct and differently organized portions. In the latter, there is an uniform appearance throughout the section, the substance not being disposed in concentric rings, but appearing as if a bed or ground of one kind was studded with specks of another order of tissue. These are not slight dissimilarities: they indicate differences of the greatest structural importance in the economy of the respective trees. Corresponding with them are peculiar modifications of every portion of the plant's organization. The external aspect of the plants of either type is altogether unlike that of the other. The part played by the tree in the landscape; the share it has in determining the peculiarities of scenery; the sentiment, so to speak, that it gives to the living picture—are mainly the results of the modifications of external form, originating in minute structure. Were it not that among woods used for ornamental purposes, the first-named type has by far the most numerous representatives, these differences would affect still more than they now do the operations of the cabinet-maker. If we place a thin slice of a young oak or plane under the microscope, we see how complicated is its anatomical structure. In its central portion is the pith, composed of minute and mostly hexagonal cells — little membranous bladders, that in the early stages of the tree's growth play a more important part than they do during its maturity. A great development of pith, as in the elder, renders the wood comparatively valueless. Around this central tissue is a circle, chiefly composed of very long spindle-shaped cells, each enclosing a loose spirally-coiled thread. This is the *medullary sheath* of botanists. It is interrupted at intervals by radiating extensions of the pith that proceed across the next element of the stem, the true wood, towards the circumference. The wood encircles in successive layers the pith and its sheath. It is composed of tough fibres, mingled in more or less orderly arrangement with vessels of various kinds, some of which give it porosity. In the first year of the stem's growth, there is but a single layer of the wood. Year after year a fresh circle is superadded, and, in temperate climates, at least, we can pronounce with certainty on the age of a tree by counting the number of annual rings of growth displayed in its transverse section. In this manner, the age of certain trees has been inquired into; and many, especially planes, cedars, limes, and oaks, have been shown to have lived the patriarchal existence of nearly, or quite, a thousand years; while yew-trees grown in our own country, have exhibited unmistakeable signs of thrice that vast longevity. Around the wood are successive layers of bark, the innermost fibrous, and investing the newest layers of wood; the middle and outer ones cellular, and often forming corky developments. Out of the inner layers of bark of certain trees, cordage and matting are sometimes constructed; the lime especially furnishes such materials. The beautiful lace-bark is this inner layer in the *Lagetta lintearia*, one of the spurge-laurel tribe. The surface of the bark is itself invested with a thin pellicle of epidermis, constituting the skin of the tree. This division into pith, wood, and bark is characteristic of the stems of exogenous or dicotyledonous trees. In the stems of endogenous or monocotyledonous trees—the Palmyra wood of commerce, or the section of a rattan are examples—there is no such distinction into these three portions. The central mass is, it is true, more or less cellular and pith-like in not a few of the palm tribe; but it is so because fewer bundles of vessels and fibres stud it than are to be found near the circumference. It is not separated from the central portion by a sheath of spiral vessels, nor do medullary rays proceed from it.

The stem, besides, is not invested by peculiar and distinct bark, though the densely-packed and tough fibres of its exterior often form an extremely tough case. If we cut down the stem of an oak or plane, lengthways, and compare it with a similar section of a palm, we see that the differences so conspicuous in the transverse are equally manifest in the longitudinal section. In the former, the several parts are ranged in lines, the sections of circles parallel to the central pith; but in the latter the lines of tissue describe more or less evident curves manifested by the direction of the darker streaks, indicating the presence of fibrous and vascular bundles. These curves, if traced through the entire length of the stem, would be found to proceed from the base of the leaves at its summit, to run inwards towards its centre, and then outwards towards the exterior, changing their minute structure in the several portions of their course, and becoming at last exceedingly tough and fibrous, so as to constitute the hard external investment. There are peculiarities of anatomical structure distinctive of some exogenous trees, and which materially affect the quality and properties of the wood. If we compare the section of a tree of the pine tribe with that of an oak or elm, we shall find in the former an absence of the conspicuous pores in the annual belts of wood that are so plainly seen in the latter; and with the aid of the microscope, we shall see that this difference is due to minute peculiarities of organization. In the pine the peculiar vessels called *dotted ducts*, that give porosity to wood, are wanting; whilst the woody layers are made up of disk-marked or punctated fibres that are not to be seen in the oak or elm, or in other trees than those that have cones for their fruit, and their immediate allies. So marked and constant is this feature of their structure, that sections taken from fossil coniferous trees exhibit the curious disks that decorate their fibres; thus, by the aid of the microscope, we are enabled with certainty to pronounce upon the affinities of plants that grew countless ages ago, when every living creature on the earth's surface was specifically distinct from any one now existing.

The appearance styled *silver-grain* in wood is dependent on the cellular tissue of the medullary rays, and is, therefore, exhibited by exogenous woods only. It gives the streaks of glancing satiny lustre, that are so ornamental in many kinds of woods. In the oak and beech this appearance is conspicuous. The inner layers of wood, after the tree has become aged, often become compact, and frequently different in colour from the new wood. They are then styled the *heart-wood*. Botanists term them the *duramen*, and apply the name *alburnum* to the outer layers or sap-wood. In the former the tissues have become dry and dense, and charged with solidifying deposits, so as to prevent them aiding in the ascent of the sap. Often, too, they become more or less deeply coloured, so as conspicuously to contrast with the pale sap-wood. This difference is especially conspicuous in the ebony-tree, the black portion of which is the *duramen*, or heart-wood. In the oak, the heart-wood is of a dark brown hue. In all trees whose older woody layers undergo such changes, the heart-wood is highly prized for purposes of furniture. In willows, poplars, and chestnuts there is no difference of colour between the heart and sap-woods. Such are styled *white-woods*. As a general rule, the latter are not nearly so durable as the former. The wood of coniferous trees appears to be least perishable; a quality which is probably due to the peculiarities above noticed, of their anatomical structure.

The forests of the colder and temperate provinces of the Old World, as well as those of corresponding regions in America, are everywhere very similar in physiognomy, being composed either of coniferous trees, of which the *pine*, the *larch*, and the *fir* are characteristic examples; or of dicotyledonous trees, among which the *amentaceous*, or catkin-bearing kinds are especially conspicuous. The timber they furnish is of great value for useful purposes; and, among the numerous varieties in which they abound, are several yielding highly ornamental woods. They want, however, the rich, brilliant, and intense colouring of tropical woods, and are, for the most part, modest in hue.

## METHOD OF REPRESENTING OBJECTS BY PRINTING DIRECTLY FROM THEM.

BY FELIX ABATE, OF NAPLES.

This invention constitutes a new art, by means of which natural and artificial objects can be represented and imitated by printing directly from the objects themselves upon any suitable substance. The specimens submitted to the inspection of the Society at its last meeting, are imitations of veneering wood, some simple, and some ornamented with inlaid work, made upon wood, calico, and paper.

Before entering into the details of this invention, I may perhaps be allowed to state, in order to prevent mistakes, that it is essentially different from the well-known invention under the name of *Phytoglyphy*, or Nature-printing, patented in England by

Messrs. Bradbury and Evans, and practised at the Imperial Printing-office at Vienna, and which consists in taking impressions in lead or other metals, or gutta percha, from natural objects, making electro-plates from such impressions, and then printing with these plates in the usual way. The principle of my invention dates from an epoch anterior to the Great Exhibition of 1851, as I exhibited on that occasion the first specimens of a particular application of it, called *Metallography*. For this branch of the art I was rewarded with the prize medal. An idea of this art will be obtained from the following notice of the principles and processes upon which it rests:

The art of *metallography* consists in printing from engraved wood blocks upon *metallic surfaces*, so as to produce imitations of figures and ornaments inlaid in wood. This effect is obtained by using, as a printing menstruum to wet the block with, solutions of such metallic or earthy salts as are decomposed when brought into contact with certain metals, and produce, through an electro-chemical action, an adhesive precipitate of a coloured metallic oxide, or any other chemical change upon the metal. Such are the salts of copper, antimony, &c., upon zinc, tin, silver, &c.; the hydrosulphuret of ammonia upon copper and brass.

There are two principles at work in this branch of the art—the one is the chemical action just referred to; the other, which is the foundation and the key-stone of the invention in its most general sense, rests in the porousness of the printing object, which causes the absorption of the wetting fluid, and yields it, under the action of pressure, in quantity for each point proportionate to the capacity of the pores; so that if any chemical change is wrought upon the impression, to produce a colouring of it, this colouring, by its different shades, makes a true representation of the printing object.

The application of the invention to printing upon vegetable substances instead of metallic surfaces, required the introduction into the process of some new principle to produce that chemical change which, in metallography, is spontaneous. I devised, for that purpose, two principles, which, by different means, lead to the same results. One of these principles I borrowed from the art of dyeing. It consists in the peculiar actions that the salts, acids, and alkalies have upon each other, and upon vegetable colouring matters. It is upon these actions the processes of mordant and discharge-printing on textile manufactures rest. The surface of the printing object is slightly wetted with the acting fluid, which is then well wiped off from the surface; the impression is then taken, which, by combining with a previous or a subsequent dyeing of the printed surface, instantaneously appears. The other principle I found in heat, that is, in the colouring action that this most powerful agent of Nature has upon vegetable substances when acted on by acids, which colouring, I believe, is the effect of an accelerated carbonisation of the surfaces of these substances produced by the acid. I think I may properly call this art THERMOGRAPHY, or the art of printing by heat.

From the following description of the process, it will be remarked—perhaps with some degree of surprise—the excessive sensitiveness of vegetable substances under the joint action of acids and heat, so that an infinitesimal dose of the former, and an instantaneous application of the latter, are sufficient to produce the most striking effects. The process is as follows:

Suppose a sheet of veneering-wood be the object from which impressions are to be taken; I expose the wood for a few minutes to the cold evaporation of hydrochloric or sulphuric acid, or I slightly wet it with either of these acids diluted, and then well wipe the acid off from the surface. Afterwards it is laid upon a piece of calico or paper, or common wood, and by a stroke of the press an impression is taken, which is, of course, quite invisible; but by exposing this impression, immediately after, to the action of a strong heat, a most perfect and beautiful representation of the printing wood instantaneously appears. In the same way, with the same plate of wood, without any other acid preparation, a number of impressions, about twenty or more, are taken; then, as the acid begins to be exhausted and the impressions faint, the acidification of the plate must be repeated as above, and so on progressively, as the wood is not in the least injured by the working of the process for any number of impressions. All these impressions show a general wood-like tint, most natural for the light-coloured woods, such as oak, walnut, maple, &c.; but for other woods that have a peculiar colour, such as mahogany, rosewood, &c., the impression must be taken, if a true imitation be required, on a stuff dyed of the light colour of the wood.

It must be here remarked, that the impressions, as above made, show an inversion of tints in reference to the original wood, so that the light are dark, and *vice versâ*, which, however, does not interfere with the effect. The reason of it is, that all the varieties of tints which appear in the same wood are the effect of the varying closeness of its fibres in its different parts, so that where the fibres are close, the colour is dark, and light where they are loose; but in the above process, as the absorption of the acid is greater in pro-

portion to the looseness of its fibres, the effect must necessarily be the reverse of the above. However, when I wish to produce the true effect of the printing wood, I alter the process as follows:—I wet the surface upon which the impression is to be taken with dilute acid, and then I print with the veneering wood previously wetted with diluted liquid ammonia; it is evident that in this case the alkali neutralizing the acid, the effect resulting from the subsequent action of heat will be a true representation of the printing surface.

Such is thermography, or the art of printing by means of heat. Now it is nothing but natural to anticipate in regard to this art, as well as to the other above-described processes for printing directly from objects, that they will afford most important services to the natural, botanical, mineralogical, and anatomical sciences; as it is by their means that the internal structure of bodies is unveiled to the eyes of the philosopher, and the wonders of nature in its inexhaustible varieties are indefinitely multiplied, to be subjected to the investigation and to serve the gratification of mankind.

But the new art will prove not less useful to the decorative arts, particularly in its application to produce imitations of rare and costly woods, as well as of works of art, mosaic and inlaid work applicable for paper-hangings, or for furniture in the place of veneering, these imitations being produced at an exceedingly low cost, while they rival in perfection the original objects, enabling those whose means are limited to obtain decoration at once cheap and in good taste. —*Journal of the Society of Arts.*

## ON MAGNETIC HYPOTHESES.

A discourse which was recently delivered at the Royal Institution, by Professor Faraday, the purpose of which was to direct the attention of the audience to the different hypothetical attempts made to account physically for the known properties of matter in relation to its magneto-electrical phenomena, followed on very naturally to one addressed to the Institution by Dr. Frankland on the 2nd instant, who then gave an account of the different views advanced by Davy, Ampère, and Berzelius, of the manner in which electricity might be associated with the atoms or molecules of matter, so as to account for their electro-chemical actions, and of the logical and experimental objections which stood in the way of each. On the present occasion reference was first made to Coulomb's investigations of mutual magnetic actions, to the hypothesis advanced by him, that two magnetic fluids, associated with the matter of magnetic bodies, would account for all the phenomena; and to Poisson's profound mathematical investigation of the sufficiency of the hypothesis. Then Oersted's discovery of the relation of common magnetism to currents of electricity was recalled to mind;—hence an enormous enlargement of the scope of magnetic force and of our knowledge of its actions; and hence Ampère's beautiful investigations, and his hypothesis (also sustained by the highest mathematical investigation),—that all magnetic phenomena are due to currents of electricity; and that in such bodies as magnets, iron, nickel, &c., the atoms or particles have naturally currents of electricity running round them in one direction, about what may be considered as their equatorial parts. After Oersted's time, further experimental discoveries occurred; currents of electricity were found competent to induce collateral currents, and magnets proved able to produce like currents, thus showing the identity of action of magnets and currents in producing effects of a kind different to ordinary magnetic attractions and repulsions. Then diamagnetism was discovered, in which actions analogous to those of ordinary magnetism occurred, but with the antithesis of attraction for repulsion and repulsion for attraction; and these were so extensive, that whatever bodies were not magnetic proved to be diamagnetic; and thus *all* matter was brought under the dominion of that magnetic force, whose physical mode of action hypothesis endeavours to account for. As the hypothesis of Ampère could not account for diamagnetic action, some assumed that magnetic and electric force might, in diamagnetic matter, induce currents of electricity in the reverse direction to those in magnetic matter, or else might induce currents where before there were none; whereas in magnetic cases it was supposed they only constrained particle-currents to assume a particular direction, which before were in all directions. Weber stands eminent as a profound mathematician who has confirmed Ampère's investigations as far as they proceeded, and who has made an addition to his hypothetical views, —namely, that there is electricity amongst the particles of matter, which is not thrown into the form of a current until the magnetic induction comes upon it, but which then assumes the character of current, having a direction the contrary to that of the currents which Ampère supposed to be always circulating round magnetic matter; and so these other matters are rendered diamagnetic.

De la Rive, who has recently most carefully examined the various hypotheses, and who, as an experimentalist and discoverer,

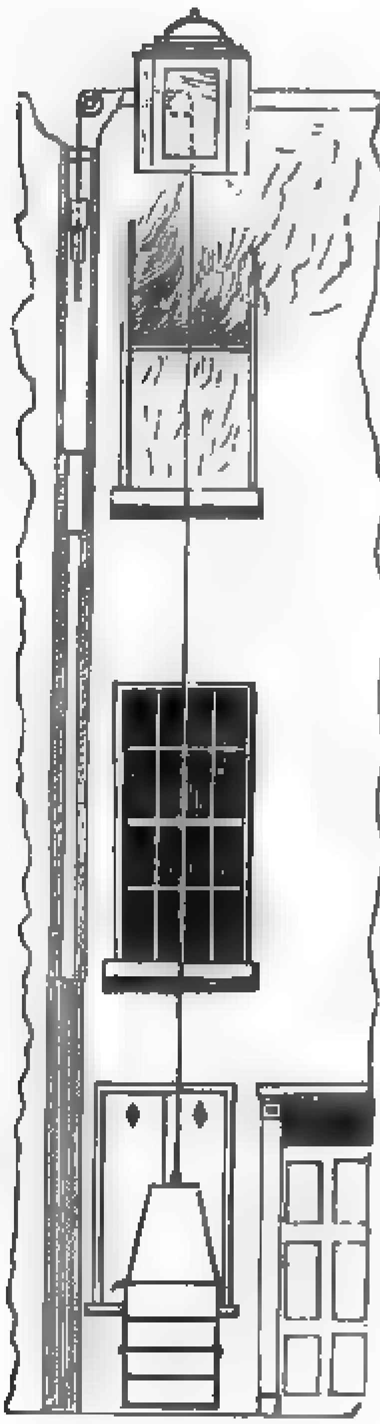
has the highest right to enter into the consideration of these deep, searching, and difficult enquiries, after recalling the various phenomena which show that the powers concerned belong to the particles of matter, and not to the masses merely (the former conferring them by association upon the latter), then distinguishes magnetic action into four kinds or modes—namely, the ordinary, the diamagnetic, the induction of currents, and the rotation of a ray; and points out that any acceptable hypotheses ought to account for the *four* modes of action, and, it may be added, ought to agree with, if not account for, the phenomena of electro-chemical action also. De la Rive conceives that as regards these modes of action this hypothetical result may be obtained, and both Ampère and Weber's views also retained in the following manner. All the atoms of matter are supposed to be endowed with electrical currents of a like kind, which move about them for ever, without diminution of their force or velocity, being essentially a part of their nature. The direction of these currents for each atom is through one determinate diameter, which may therefore be considered as the axis. Where they emerge from the body of the atom they divide in all directions, and running over every part of the surface, converge towards the opposite end of the axis diameter, and there re-enter the atom to run ever through the same course. The converging and diverging points are, as it were, poles of force. Where the atoms of matter are close or numerous in a given space (and chemical considerations lead to the admission of such cases), the hypothesis then admits that several atoms may conjoin into a ring, so that their central or axial currents may run one into the other, and not return, as before, over the surface of each atom; these form the molecules of magnetic matter, and represent Ampère's hypothesis of molecular currents. Where the atoms, being fewer in a given space, are farther apart, or where, being good conductors, the current runs as freely over the surface as through the axis, then they do not form like groups to the molecules of magnetic matter, but are still considered subject to a species of induction by the action of external magnets and currents; and so give rise to Weber's reverse currents. The induction of momentary currents and the rotation of a ray are considered by De la Rive as in conformity with such a supposition of the electric state of the atoms and particles of matter.

The lecturer seemed to think that the great variety of these hypotheses, and their rapid succession, was rather a proof of weakness in this department of physical knowledge than of strength, and that the large assumptions which were made in turn for each should ever be present to the mind. Even in the most perfect of them, that is, De la Rive's, these assumptions are very considerable; for it is necessary to conceive of the molecules as being flat or disc-like bodies, however numerous the atoms of each may be; also that the atoms of one molecule do not interfere with or break up the disposition of those of another molecule; also that electro-chemical action may consist with such a constituted molecule; also that the motive force of each atom current is resident in the axis, and on the other hand that the passage of the current over the surface offers *resistance;* for unless there were a difference between the axial and the surface force in one direction or the other, the atoms would have no tendency to congregate in molecules. In making these remarks, however, the speaker had no thought of depreciating hypothesis, or objecting to its right use. No discoverer could advance without it; and such exertions as those made by De la Rive, to bring into harmony thoughts which in their earlier forms were adverse to each other, were of the more value, because they were the exertions of a man who knew the value both of hypothesis and of laws, of theory and of fact, and had given proofs of the power of each by the productions of his own mind. Still the speaker advocated that mental reservation which kept hypothesis in its right place, and which was ready to abandon it when it failed; and as examples referred to Newton, who (as is shown by his letters to Bentley) had very strong convictions of the physical nature of the lines of gravitating force, yet in what he publicly advanced stopped short at the law of action of the force, and thence deduced his great results; and also to Arago, who, discovering the phenomena of magnetic rotation, yet not perceiving their physical cause, had that philosophic power of mind which enabled him to refrain from suggesting one.

## WALTERS' FIRE ESCAPE.

The accompanying engraving represents a method of constructing a fire-escape, planned by Mr. Walters, who has exhibited models of the arrangement at the Panopticon, Leicester-square. The method consists in placing in a chamber, formed so as to present an ornamental appearance at the upper part of the house, immediately over the windows, a metallic cradle, connected by means of a metallic wire, which passes over two pulleys, to a series of weights of such magnitudes, and so disposed, as to be taken up successively, when the cradle is made to descend by a weight of any kind placed

within it, thus checking the tendency to acquire a continually accelerated velocity, which the action of gravity would exert upon the cradle and its contents. The checking weights, of which there may be any suitable number, are placed at different heights upon shoulders formed in a tube placed in some convenient position, either without or within the building, and have holes formed in them, so that when the



cradle, after descending, is liberated at the ground, and begins to ascend, the several weights may be deposited upon their respective shoulders. The system in its present form is evidently open to several practical objections; such as its want of adaptability to the weight of the different persons, or of the different numbers of persons who might require to descend in the cradle, and the difficulty of ensuring the free passage of each weight down to its own appointed bearing, during the ascent of the cradle, &c.; but for some purposes, and with some modifications, it may probably be employed with advantage.

## DOCKYARD CAISSONS.

*To the Editor of the Mechanics' Magazine.*

Sir,—No. 1317 of your Magazine, 4th November, 1848, gave a description of the floating caisson-gate of the great basin in Portsmouth Dockyard, also a copy of Sir Samuel Bentham's proposal of that caisson; in a late Number is likewise an account of the sliding caisson at Keyham; but as some misconceptions appear to have been entertained as to the caisson at Portsmouth, I have forwarded some "Observations" to the Secretary of the Institution of Civil Engineers; a copy of which, and of the note that accompanied them, I inclose for your Magazine, should they be acceptable.

I am, Sir, yours, &c.,
M. S. B.

June 14, 1854.

13th June, 1854.

Sir,—Having been favoured with a "private press" notice of the paper read at the Institution of Civil Engineers on the 9th ult., I conclude that Mr. Fairbairn could not, from his own knowledge, have so spoken of Sir Samuel Bentham's caissons; I have therefore drawn up the inclosed "Observations," which, in justice to Sir Samuel's memory, it is trusted you will lay before the Council of the Institution, and that they will be pleased to refute the misconceptions that have been entertained.

I am, Sir, yours, &c.,
M. S. Bentham.

C. Manby, Esq., Secretary of the Institution of Civil Engineers, &c.

*Observations relative to the Caisson at Her Majesty's Dockyard at Keyham.*

At the Meeting of the Institution of Civil Engineers, 9th May, 1854, the paper read was "A description of the Sliding Caisson at Her Majesty's Dockyard, Keyham, Devon, by Mr. W. Fairbairn, M. Inst. C.E."

This paper related that "Caissons for closing the wide entrances of docks were first suggested in this country by General Sir Samuel Bentham; that since his time they have been somewhat extensively used, although the objections of occupying a considerable time in having the water pumped out of them, and it being neces-

sary to float them entirely away from the opening before a vessel could pass, rendered them only applicable for special localities." It is to these objections that the following observations are principally directed.

It appears that the caisson at Keyham was designed by Mr. Scamp, and that the iron work for its construction was confided to Mr. Fairbairn. The means he employed for giving it strength add a feather to the rich plume which adorns that gentleman's cap; it is Mr. Scamp's originality of invention that is questioned as relates to valves, the means of giving buoyancy to the caisson, and of sinking it in its place without need of *pumping* water in or out of it.

Sir Samuel's first proposal for a *floating dam*, as it was then called, was in 1798, for closing the entrance of the great basin in Portsmouth Dockyard; his plan was approved of by the Admiralty, the caisson built accordingly, and put into its place at the opening of that basin. 12th January, 1801. A copy of the General's proposal was published in No. 1317 of the *Mechanics' Magazine*, November, 1848; as was also the copy of a private letter from the master shipwright of Portsmouth Yard, giving an account of the successful first employment of the caisson.

On reference to that proposal, it will be seen that, after speaking of the ballast requisite to give the caisson stability, the General went on to say, "What little addition of weight it will require to keep the vessel from rising out of the groove at the time of high water, is to be obtained by letting water into one or more of the cisterns formed in the vessel immediately under the deck. This water would of itself run out of the cistern at the time of low-water, even at neap tides, by means of the *penstocks* or *valves*, as shown in the profile."

Now from that proposal it is evident that *no* pumping was requisite for raising water out of Sir Samuel's caisson at Portsmouth. However, being scruplously exact in providing for extreme cases, he added that if, "at the time of high water it should be required to open the gate on the *sudden*, the water in this case must be pumped out of the cisterns." It does not appear that the water in Mr. Scamp's cisterns could be got rid of in similar circumstances otherwise than by *pumping*.

From the above it seems clear that in respect to valves for clearing the Keyham caisson from water, no advance has been made upon established practise of half a century; but, to assure myself in this particular of accuracy, I applied to a gentleman who had for many years been the master shipwright of Portsmouth Yard: he has in consequence informed me that "in regard to any novelty in the idea of admitting water to the caisson by means of *penstocks or valves*, I have to say that I have never known a caisson without such an arrangement. It is a notorious fact, that the caissons in the Royal Dockyards are weighted with water admitted in such a way, and that the water is let out by opening the valves. Some alteration has been made, since the introduction of iron caissons, in the method of opening the valve. A screw is used for that purpose, but that is only a simple mechanical contrivance to carry out the same principle;" and added, that "General Bentham had no less the merit of the *valve* than he had of the caisson itself."

It was in regard to the valve that Sir Samuel's caissons differed from foreign examples, as in them water was *pumped* out.

Sir Samuel's caissons, said to be applicable only to special localities, have been negatived by his having introduced them in the appropriation of an old work, the boatcamber in Portsmouth yard, to docks for one, two, or three frigates at pleasure, the entrances to which were closeable at their different lengths by the same caisson; but as other difficulties are alleged, it was thought desirable to obtain information from a gentleman who had had long experience in our principal dockyard. To inquiries on this subject the reply was, "I have much pleasure in informing you that I never found any inconvenience in floating this caisson (General Bentham's) out of its place either at Portsmouth or any other yard where I have been."

The time consumed in opening or closing an entrance remained to be ascertained. At Keyham this is stated to be effected in ten minutes for the opening, and eight minutes for the closing; but whether this be the *average* time, or only some special occasion, is not mentioned. The reply I obtained frem Portsmouth was as follows: "The *average* time required to float the caisson out of or into its place is about ten minutes." Thus, in regard to time, the difference between the original caisson and that at Keyham is hardly appreciable, seeing that in the one case the time is on an *average*, in the other apparently but one occasion. If (as has been said) the water at Keyham is supplied by the fresh-water pipes, that may cause the two minutes difference in sinking the caisson.

As to the superior advantages of a rectangular caisson, that must remain an engineering problem. In the proposal of 10th September, 1799, it is stated as follows: "Instead of a flat bottom of woodwork, and

side walls only of masonry, the whole is of masonry in the form of a reversed arch.... A *floating-dam* is made to fit water-tight into a groove wrought in the arch of masonry, by which means the entrance will be shut up, and the water will be kept in or out of the basin.

"This floating-dam, which is built much in the form of a navigable vessel"—(here follows the description of it), and afterwards goes on to say, "The curvature given to the sides, at the same time that it affords a degree of capacity to the vessel sufficient to make it support the weight of the superincumbent bridge, together with a sufficient quantity of ballast to give it stability, enables the sides likewise the better to resist the pressure of the water at the greater depth."

June 13, 1854.

## URWIN'S PATENT STEAM ENGINE IMPROVEMENTS.

*To the Editor of the Mechanics' Magazine.*

SIR,—In your number for June 10th you give a description of an arrangement of steam engine, for which letters patent have been granted to Mr. Urwin, of Stepney. Will you allow me space to inquire whether the said arrangement is an improvement or not upon the one now in use. In the first place, then, I will admit Mr. Urwin's object to be a good one, and could it be accomplished in the arrangement shown, it would also be a simple one; but this, I think, is rather doubtful. We will, to show the first, and may be the least objection, suppose an engine with a five feet stroke arranged with the exhaust passage midway in the cylinder. Allowing, on a rough estimate, that the passage is 4 inches deep, the piston in this will require to be about 2 feet 6 inches deep. Now, just imagine for a moment this ponderous piston moving at a high velocity when the cylinder is on the horizontal; you will readily admit that it only adds to an objection in the horizontal engine at present existing. We will pass the doubt as to the possibility of keeping the said piston steam tight and preventing waste of steam, and come to examine the greatest advantage supposed to be derived; namely, the clear exhaust into the chamber containing the water, and also the constant use of the steam and water to supply the boiler. It is evident that a clear exhaust can be had in proportion to the area of the passage for the exit of the steam; but it is not so evident that a good vacuum can be got by simply passing the steam into the chamber containing the water. The continual discharge of the steam into the said chamber will increase the temperature of the water to such a degree that condensation will not take place to incur the back pressure being removed from the bottom or top of the piston; the greater body of water contained in the chamber will only increase the difficulty. It may be said that a large surface for the chamber will be used; but even this, I think, would not be sufficient, unless a constant stream of cold water was brought in contact with the said chamber, or was made to pass in circulation through it by means of tubes or other suitable means: in this case the water would require to be well mixed with the steam, as in the ordinary injection. You are aware that Hall had a trial of a condenser with a much greater amount of circulation surface for the cold water, but did not accomplish his object; there are several similar attempts at the same thing, and all as yet have alike failed.

Could Mr. Urwin's invention be brought to practise, it would of course be most available in marine engines; in which case where would the fresh water be had from to supply the waste arising from evaporation, &c., and would he not be liable in this case (with the cylinder vertical) to have the water in the cylinder, arising from the cylinder and condenser being nearly on the same level, and no air-pump to draw off the superabundant water? I cannot see how he uses the steam more economically than in the ordinary expansive engine, although I can readily conceive his being able to work with very high-pressure steam. Much more might be said on the subject, which is a most important one, and any invention to attain which would be a great boon to the engineering world, and your report of Mr. Urwin's arrangement will no doubt lead to inquiry on the subject.

I am, Sir, yours most respectfully,

ENGINEER.

Manchester, June 21, 1854.

## CASTING BELLS.

*To the Editor of the Mechanics' Magazine.*

SIR,—A patent has lately been obtained for "improvements in the manufacture of large bells." The so called *improvement* is stated thus:—"In place of making a temporary bell of loam and other matters on the core * * * we construct the outer mould without the aid of such temporary bell * * * and we produce the outer mould by using a hollow iron casting perforated with numerous holes, and having its exterior form corresponding generally to the intended bell. By the aid of a template rotating on a central axis within the mould, this is made to

assume the form for producing the correct exterior form of the bell."

Now so far from this being a *novelty*, it has been in use from time immemorial; so far from being an *improvement*, we have uniformly discarded it whenever we have required that degree of accuracy which results from perfect parallelism of the inner and outer surfaces of the bell; or in other words, from the inner and outer surfaces being throughout concentric. It is nevertheless a convenient and rapid process for such work as only requires neatness of appearance, and we have therefore commonly adopted it in our smaller and less important or less accurately-toned bells; and we should wish to use it for such work as hitherto. Are we forbidden to continue our old practice because a patent has been obtained for it by another firm, young in the art, as an "improvement in casting large bells?"

I am, Sir, your obedient servant,

Z.

[The patentees referred to can by no means interfere with the practice of our correspondent; indeed, if the statements contained in the foregoing letter be accurate, their patent is altogether worthless.—Ed. M. M.]

## ON THE MANUFACTURE OF PAPER FROM VEGETABLE LEAVES.

M. Vivien, of Paris, has obtained a patent in this country for a method of manufacturing paper from the leaves of trees, plants, &c., of all descriptions. In carrying out his invention, the leaves which are gathered at a suitable season, are compressed into cakes, and then steeped in lime-water or in an alkaline solution, after which the mass is washed and reduced to pulp by any suitable means. This pulp is then treated according to the quality of the paper to be produced, by applying to it the different operations of sizing, bleaching, &c., in the ordinary way. If it is thought necessary, the pulp formed in the foregoing manner, from vegetable leaves, may be mixed with rag or other pulp in any proportions.

## LEWIS'S IMPROVED NAUTICAL SIGNAL LAMP.

(Patent dated December 22, 1853.)

Mr. C. Lewis, of Hull, has invented a very useful lamp for signalling by means of coloured lights, which is intended mainly for nautical purposes, but which may be employed with advantage in all cases to which this method of signalling is applicable.

His lamp is fitted in front with a permanent white bull's eye, or lens, and has sides formed of double plates, between which he causes to slide on one side a red, and on the other side a green glass. A slot is made through the outer casing on both sides, and the red or green glass is made to slide forward by means of a stud, which is connected to the frame in which the glass is fitted, and which passes through the slot. Other coloured glasses than green or red may be employed if preferred for any particular signals.

The coloured lights may of course be arranged for indicating sets of signals, for nautical purposes; for example, when the red and green glasses are in their places, and consequently, when the light would appear white, the signal might be interpreted, "I see you." When the red glass is brought between the light and the white lens a red light would be exhibited, which might denote, "I am on the port tack," or "I will pass you to port." And when the green glass is made to take the place of the red one, it might signify, "I am on the starboard tack," or "I will pass you to starboard." It will be readily understood that by means of the white, red, and green lights, any previously understood signal could be readily made. Fig. 1 is a longitudinal section of a lamp or lantern, fitted according to this invention; and fig 2 is a cross section of the same. A A is the casing, and B, the wick, or light; C is an internal shield, placed in the inside of the casing; D and E, are two metallic frames containing glass of the colours to be determined upon for the purpose of signalling. These glasses are free to slide upon the guides, *a a*, between the shield, C, and the outer casing, when acted upon by the knobs or handles, F F'. A slot is cut in each side of the casing to admit of the shank part of the handles being passed through, so as to attach them to the frames of the glasses. A notch is cut in each end of the groove, and a slight amount of play is given to the handles, so that when the glasses are shifted, the shanks of the handles fall into the notch and retain the glass till it is again desired to shift it, which is effected by first slightly raising the handle free of the notch, when the glass can be brought either into or out of action. G is the white lens. Supposing that it is desired to show the green light, and the position of the slides to be that represented in the engravings, the lamp then showing a white light, the

operator would slightly raise the handle, F′, and slide it forward towards the lens, G, until the handle were brought to the opposite end of the slot, when the green glass would be interposed between the light and the white lens, and the handle would

Fig. 1.

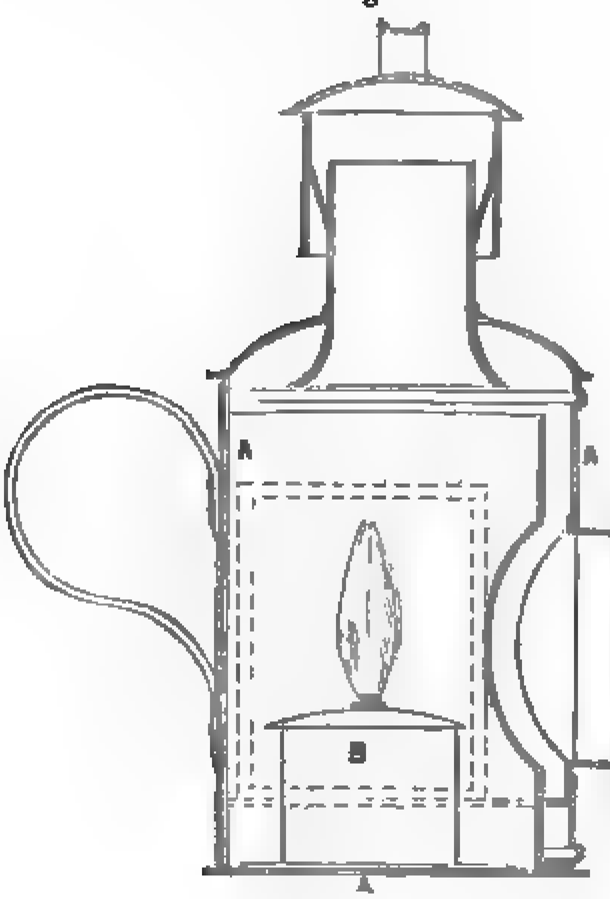
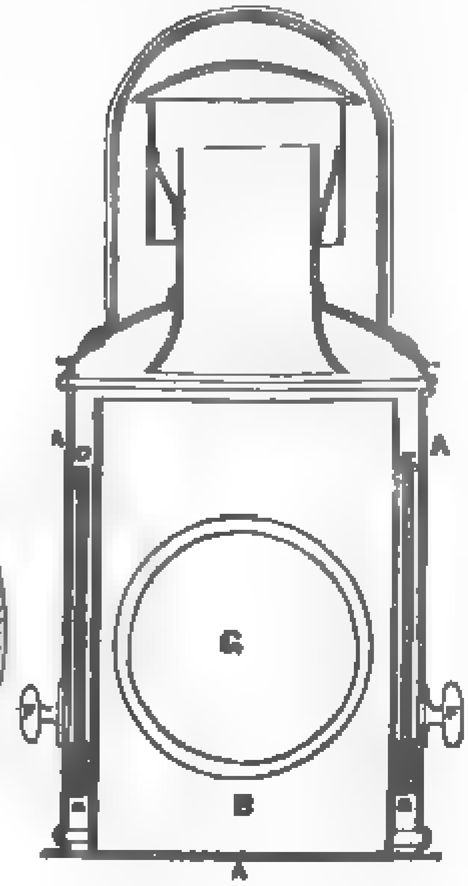



Fig. 2.




fall into the notch, so as to retain the glass until it is desired to shift it back, to again exhibit the white light, or to bring forward the red glass to show a red light.

## IMPROVEMENTS IN SEPULCHRAL MONUMENTS.

We have much pleasure in directing the attention of our readers to a highly gratifying improvement in monumental art that has been produced by Mr. Potts, of Birmingham, beautiful specimens of which are now being brought before the public by that gentleman. The great cost of sculptured memorials has always been a source of two evils, viz., the exclusion of all but the wealthy classes from the participation in the sacred pleasure that is associated with the commemoration of the estimable qualities of departed relatives and friends, and the rarity of works of a high class of art in our churches, cemeteries, and other public places. The existence of these evils is now more painfully and generally felt in this country than at any former period of its history; for neither that aristocratical spirit of exclusion which in former times debarred all but the higher classes from the possession of works of sympathetic art, nor that puritanical faith which long sought to expel all art utterly from the services of religion and humanity, are any longer dominant. The conviction is now perfectly general that both religion and art, to attain their true ends, must minister to the spiritual and moral improvement of all. Another fact that has lately become generally appreciated is, that the diffusion of inferior works of art throughout the land is rather pernicious than improving; and that therefore it would be better to content ourselves with a few choice productions, than to multiply others of an indifferent character. The result is, society has been affected with a desire which it found itself unable to gratify; it has been made sensible of a necessity that it was incapable of ministering to, and it was doubtless from the consciousness of this discrepancy that the present improvement arose.

We may also observe that the want to which we have just adverted existed very markedly in that department of art which embraces the erection of sepulchral monuments; the department to which, above all others, the genius and skill of the artist might surely be most fitly consecrated. Nothing can be more sterile, more thoroughly deficient of genuine artistic ornamentation than English tombs. And this does not arise from parsimonious causes. There is nothing on which our countrymen would more willingly lavish their wealth,—nothing over which they would be less disposed to bargain for cheapness, than the vaults of their dead friends. But the fact is, monuments wrought in stone or marble are so costly, as to be altogether out of the reach of the great body of the people, and consequently the erection of them has not, nor could have, become a national practice.

Mr. Potts, impressed probably with the truth of this, was induced to seek some process by which durable sculptural works, possessing all the essential qualities of the most admired existing productions, might be cheaply produced. The accuracy and facility with which models may be copied by electro-metallurgical processes fortunately occurred to him, and the result has been the production of an entirely new style and class of art, capable of producing most powerful and finished effects, at a cost greatly inferior to that of the most ordinary works of the sculptor in stone or marble. The great feature of the invention consists in the combination of marble or stone framings with metallic figures formed by the electrotype process, and all the effects which are capable of being produced by the employment of coloured marbles, scagliola, etc., may of course be obtained by the new process, with the immense advantage of altogether avoiding the laborious effort and delicate care which the artist has hitherto had to bestow upon the block, in order to obtain those perfect outlines, and bold shadows, and true expressions, which constitute the great merit of his work.

It will be at once apparent that the method above pointed out may be applied to the production of any devices. Indeed, Mr. Potts' system will admit of a much greater variety in monumental designs than was compatible with the hand processes by which such works have hitherto been executed, and while in the latter the difficulties of the execution tended necessarily to augment the labour bestowed upon the production, and consequently its cost, the former is independent of any intricacies or complications; a bust portrait, a group of angels, or a vase of flowers being as easily imitated with the utmost exactness as the plainest possible device. In this aspect the new system possesses great interest, for it will open the way for the exercise of the highest skill and the purest taste in the preparation of designs. Every one knows how the urn and the angel have been repeated generation after generation on the gravestone and the vault, and must have felt, that while the pen of the poet has been perpetually consecrating new symbols to the life of the saint and the hope of the Christian, the chisel of the sculptor has failed to strike out fresh types of these upon their tombs. This need not continue longer, and will not, we apprehend. Already we have seen specimen monuments wrought on the new system, and designed by the inventor, which afford full confirmation of the propriety of the anticipations we feel on this point. And it is impossible that there should be any lack of ability on the part of artists to furnish designs, should the invention pass from the hands of the enterprising originator of it.

The results of Mr. Potts' improvements will very soon, we trust, begin to be generally witnessed, in the substitution of well executed monuments for many of those which at present would be considered as disgraceful caricatures, were they not redeemed by the consideration of the object for which they were reared, and in the erection of others by the many hands which have hitherto been held from the holy task of perpetuating the virtues of those whom they have lost, through the want of such an accessible form of art as that we have described.

## PRODUCTION OF OXYGEN GAS.

M. Boussingault has lately described a process by which pure oxygen gas may be obtained from the atmosphere at a trifling cost, so as to enable it to be collected in unlimited quantities, and preserved in gasometers, like coal-gas, for application to many practical uses in the arts. This process depends upon a peculiar property possessed by the earth barytes, of absorbing the atmospheric oxygen at one temperature and evolving it at another; or rather, the ready conversion of hydrate of barytes into peroxide of barium, by a current of atmospheric air at a dull red heat, and the decomposition of the peroxide, by steam, at a lower temperature, even at 212° Fahr., with reformation of the hydrate of barytes—the process being in reality a continuous one.

It is found in practice advisable to mix the barytes with hydrate of lime or magnesia, so as to prevent the fusing of the first; this mixture, when placed in an earthen tube heated to dull redness, is to be oxidized

by passing a current of dry atmospheric air over it. So soon as the oxidation is completed, the tube is connected with the gas-holder, and a jet of steam allowed to act upon it; this re-converts the peroxide of barium into hydrate of barytes, the excess of oxygen being given off and collected in the gas-holder. The barytes is then again oxidized by a fresh current of air, and deoxidized by steam, as frequently as required, thus making the process continuous. M. Boussingault considers that about 1,000 cubic feet of pure oxygen gas could be obtained every twenty-four hours by the use of 10 cwts. of barytes, which will answer this purpose for any length of time.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

MACKENZIE, CHARLES, of Bayswater, Middlesex, Esquire, and ALEXANDER TURNBULL, of Manchester-square, Middlesex, doctor of medicine. *Machinery for paring fruit or vegetables.* (A communication.) Patent dated December 9, 1853. (No. 2863.)

The inventors pare fruit, &c., by means of a revolving mandril, which carries it "in combination with an adjustable knife or cutter, which is passed round the fruit, &c., in a direction at right angles or nearly so to the motion of the fruit or vegetable itself."

ECCLES, RICHARD, of Wigan, Lancaster, spinner, JOHN MASON, of Rochdale, said county, machinist, and LEONARD KABERRY, of Rochdale, aforesaid, manager. *Improvements in slubbing and roving frames for cotton and other fibrous substances.* Patent dated December 9, 1853. (No. 2865.)

This invention consists, firstly, in the application to slubbing and roving frames of suitable holders, mounted above the roller beam, by which the flyers may be held during the doffing of the bobbins. The invention relates, secondly, to the wheel work for driving the bobbins; and, thirdly, to an additional bearing for the spindles of slubbing and roving frames, obtained by so forming the fixtures attached to the "lifter rail" that there is a bearing at the lower as well as at the upper end.

SUTCLIFFE, JAMES, of Manchester, Lancaster, machinist. *Improvements in steam engines and in apparatus connected therewith.* Patent dated December 9, 1853. (No. 2866.)

*Claims.*—1. Causing the piston of the low pressure or expansion cylinder to perform a greater number of strokes in a given time than that of the high pressure cylinder. 2. Cooling the water arising from the condensation of the steam, and using it as injection water for the condenser.

OSBORNE, FREDERICK, of Aldersgate-street, London, tailor. *Improvements applicable to the distribution of manure.* Patent dated December 9, 1853. (No. 2867.)

*Claims.*—1. The application to manure carts of a drum or roller provided with tines or their equivalent, for taking up the solid manure contained therein, as it is moved towards the discharging opening, and scattering it over the ground required to be manured. 2. An arrangement for clearing the discharging orifices of liquid manure carts.

CHISHOLM, JOHN, of Holloway, Middlesex, practical chemist. *Improvements in the distillation of organic substances, and in obtaining products therefrom.* Patent dated December 9, 1853. (No. 2868.)

This invention consists in distilling animal and vegetable bodies mixed with salts of lime, potassa, or soda, so as to obtain cyanogen compounds, in close vessels, such as the retorts used in the manufacture of coal gas.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in portable cases for containing provisions.* (A communication.) Patent dated December 9, 1853. (No. 2869.)

This invention consists in constructing an apparatus composed of three or more chambers formed of metal, glass, earthenware, or other convenient material; two of which chambers are intended to contain fluids, and are fitted with stoppers which are hollow and perforated laterally, to contain spices and similar matters. An intermediate space between the two liquid holders serves to contain solid food.

SCHAEFFER, WILLIAM, of Stanhope-terrace, Middlesex, chemist. *Improvements in purifying spirit.* Patent dated December 9, 1853. (No. 2871.)

This invention consists in purifying spirits by filtration, through a filter composed of charred wood (birch wood by preference), boiled grain (wheat by preference), broken oyster-shells, and sand.

BOURNE, JOHN, of Port Glasgow, Renfrew, Scotland. *Improvements in steam engines.* Patent dated December 9, 1853. (No. 2872.)

The inventor proposes to employ double discs, connected together by a rigid and inflexible crank-pin, together with counter weights. He also describes and claims a method of lubricating the crank-pin.

BOURNE, JOHN, of Port Glasgow, Renfrew, Scotland. *Improvements in machinery for the production of iron ships and other similar structures.* Patent dated December 9, 1853. (No. 2873.)

This invention consists in poising a punching and riveting machine upon trunnions, so that it may be swivelled in any

way, and yet retain its efficiency, the power (whether imparted by water, steam, shafting, or otherwise) being introduced by one or both of the trunnions, so that its introduction is prevented from impeding the free movement of the machine.

BOURNE, JOHN, of Port Glasgow, Renfrew, Scotland. *Improvements in the construction of iron ships.* Patent dated December 9, 1853. (No. 2874.)

This invention consists in a mode of running the beams, ribs, and floors of a vessel in a fore and aft direction, and in constructing ships with a moveable framework, and in forming the stern frames of screw vessels with a horizontal palm for their more effectual attachment to the ship. The inventor also proposes to use deck screws, formed with conical necks, for jamming into the holes in the iron, instead of those with cylindrical necks at present employed.

BESSEMER, HENRY, of Baxter-house, Old St. Pancras-road, Middlesex, engineer. *Improvements in the construction of railway axles and breaks.* Patent dated December 9, 1853. (No. 2875.)

*Claims.*—1. The combination of iron with other dissimilar metals in the construction of railway axles. 2. The construction of railway axles in such manner that the pressure produced by the lateral oscillation of the carriages may be sustained by the ends of the axles. 3. The application of hydrostatic pressure to railway breaks. 4. The use of elastic or expanding chambers, whereby hydrostatic pressure may be applied to railway breaks, without the intervention of pistons and cylinders. 5. An arrangement for transmitting the pressure of steam in locomotive engines to the breaks of railway carriages.

MACPHERSON, ALLAN, of Brussels, Belgium, gentleman. *Improvements in disinfecting sewers or other drains or depositories of fœtid matters or gases, and in converting the contents thereof to useful purposes.* Patent dated December 10, 1853. (No. 2876.)

The inventor claims the use of certain kilns for carbonizing peat, with modes of arresting, purifying, and deodorizing noxious gases in sewers, and the reception of sewerage into reservoirs or barges charged with the purifying and deodorizing materials.

COATES, CHARLES, of Sunnyside, near Rawtenstall, Lancaster, mechanic. *Improvements in and applicable to looms for weaving.* Patent dated December 10, 1853. (No. 2878.)

*Claims.*—1. The application of a break to the lay or batten of looms for the purpose of checking its momentum. 2. The application of a buffer for stopping the lay or batten. 3. The application of vulcanised India-rubber, or other elastic material, to the check-bands or straps against which the pickers act. 4. An improved mode of driving looms by fixing a friction-pulley on the tappet shaft. 5. The use of a chamber placed round the guide-spindle of the picker to contain lubricating material. 6. The application of vulcanised India-rubber, or other suitable elastic material, to that part of pickers which acts against the shuttle.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in furnaces for the manufacture of steel.* (A communication.) Patent dated December 10, 1853. (No. 2881.)

One arrangement described by the patentee comprises two melting chambers or furnaces, which have one chimney and ash-pit, and contain the crucibles for melting the metal. The gases from these chambers pass into a common chimney, and on their way are made to heat a steam-boiler. An opening is formed beneath the grates on which the crucible rests for allowing the attendant to examine the state of the furnaces, and this opening communicates with an inclined passage, which leads to an ash-pit. A metal plate is employed to catch the steel should it escape from the crucibles, and to prevent it from mixing with the cinder. There are several furnaces or fires to each melting chamber, and the furnaces for baking the crucibles are arranged on one side of the chimney.

GREEN, EDWARD, of Wakefield, York, engineer. *Improvements in boilers and furnaces.* Patent dated December 10, 1853. (No. 2882.)

A description of this invention forms the first article of this Number.

GUIBERT, NICOLAS VICTOR, of Paris, France, practical engineer. *Improvements in forge hammers.* Patent dated December 10, 1853. (No. 2883.)

*Claims.*—1. Certain mechanical arrangements for working vertical forge hammers. 2. A certain construction of contact pullies, and their application to working vertical forge hammers. 3. Directing the fall of forge hammers by means of a toothed collar and endless screw.

THORNLEY, WILLIAM, of Clayton West, York, manager. *An improved manufacture of woven fabrics.* Patent dated December 10, 1853. (No. 2884.)

*Claim.*—Producing a double-faced fabric consisting of two similar or different fabrics, which, during the process of weaving, are connected together, so as to form one double fabric.

WHITEHOUSE, EDWARD ORANGE WILDMAN, of Brighton, Sussex, surgeon. *Improvements in effecting telegraphic communi-*

*cations.* Patent dated December 12, 1853. (No. 2885.)

In one of the arrangements described by the inventor the circuit is never broken or interrupted during the actual working, an instrument which he denominates the "manipulator" enabling the operator, without breaking contact, either to direct the current to one or more distant stations for actual use, or to drain it off, and make it return by short circuits through its own instrument, in doing which the electrical current may either be made to record or not at pleasure.

HOLLINSWORTH, THOMAS, of Winwick, near Warrington, Lancaster, engineer. *Certain improvements in the method of applying breaks to carriages employed upon railways, and in the machinery or apparatus connected therewith.* Patent dated December 12, 1853. (No. 2886.)

This invention consists in another adaptation of air-pumps and receivers to the breaks of railway carriages.

REDGRAVE, WILLIAM, of Croxley-green, Rickmansworth, Hertford. *An improved safety travelling-cap.* Patent dated December 13, 1853. (No. 2888.)

This invention consists in applying to caps one or more circular air-tight tubes, which may be inflated when required.

HANNEY, GEORGE KERR, author, of Ulverston, Lancashire. *The combination and manufacture of composition grinding-wheels, hones, and other grinding bodies.* Patent dated December 13, 1853. (No. 2889.)

This invention consists in "mixing with lac certain more brittle gums or resins, asphaltum, pitch, coal-tar, coal-tar pitch, and sugar; and also in mixing with lac oil or grease alone, or oil or grease with sugar, for a bond when a composition grinding-wheel or hone, or grinding or polishing body, has to be formed."

WANSBROUGH, JAMES, of the Grove, Guildford-street, Southwark, Surrey, waterproofer. *Improvements in the manufacture of waterproof fabrics.* Patent dated December 13, 1853. (No. 2890.)

This invention consists in giving to waterproof fabrics an artificial face or finish different from that of the fabric itself, so as to resemble woollen cloth. The principal feature of the process is the saturating of the cloth with a solution of India-rubber or gutta percha, after the flock has been placed upon it, and then passing the fabric between pressure-rollers.

PLUMMER, WILLIAM FREDERICK, of St. Mary's Overy Wharf, Southwark, mechanist. *Improved machinery for grinding or crushing animal, vegetable, and mineral substances.* Patent dated December 13, 1853. (No. 2891.)

The inventor proposes to arrange two rollers composed either of stone or metal, one above the other, in the same vertical plane, and to set a third roller parallel to the top roller, but a little higher than it, and towards the side of it, and to feed the material which is required to be operated upon between the upper rollers by means of a hopper set above them.

SCHIELE, CHRISTIAN, of North Moor Foundry, Oldham, Lancaster, engineer. *Improvements in preventing undue oscillation in engines, machinery, carriages, and other apparatus.* Patent dated December 13, 1853. (No. 2892.)

This invention comprises several arrangements of parts, such as frictional collars and bush-brake pieces, for checking the oscillation of governor-spindles, buffer-rods, &c.

GRANT, PHILIP, of Manchester, Lancaster, letter-press printer and stationer. *Improvements in printing-presses.* Patent dated December 14, 1853. (No. 2895.)

The press described by the inventor is furnished with a reciprocating table, and the downward motion of the platen is caused by levers under the framework of the press acted upon by cams or eccentrics, fixed on the main shaft, and working against friction-bowls on the lever ends. The inking apparatus is made partially self-acting by means of rollers revolving in suitable bearings fixed on the side-frames. The inventor proposes to print in different colours at the same time.

GATTY, FREDERICK ALBERT, manufacturing chemist, and EMILE KOPP, professor of chemistry, both of Accrington, Lancaster. *Improvements in printing and dyeing cotton, wool, silk, and other fibrous substances.* Patent dated December 14, 1853. (No. 2896.)

This invention "consists in the use of lactic acid and its neutral and acid salts, as substitutes for tartaric, citric, and other acids and their neutral and acid salts" for the purposes described in the title.

COFFEY, JOHN AMBROSE, of Providence-row, Finsbury, Middlesex, pharmaceutical engineer. *An improved method of evaporating liquids.* Patent dated December 14, 1853. (No. 2897.)

*Claim.*—A "method of evaporating liquids by causing atmospheric air or other gases to pass through them, the air or gas used being in such a state when introduced into the liquid that the vapour of the liquid shall become diffused into it, and thus be carried off."

BEANES, EDWARD, of Charlotte-street, Portland-place, Middlesex. *Improvements in the manufacture and refining of sugar.* Patent dated December 14, 1853. (No. 2898.)

This invention consists in constructing a

vacuum pan fitted with an arrangement of tubes by which heat is introduced into the pan and applied to the liquid within it, for the purpose of evaporating saccharine solutions at a comparatively low temperature.

KAY, JOHN ZUILL, of Dundee, Forfar, gas engineer. *Improvements in gas-meters.* Patent dated December 14, 1853. (No. 2899.)

This invention consists in the use in gas-meters of a dip-tube, through which the gas passes to the outlet pipe, the mouth of this tube being just above the water-level, so as to be closed by the water when the meter is tilted, or when too much water is supplied to it.

FULLWOOD, BENJAMIN, of Abbey-street, Bermondsey, Surrey, manufacturing chemist. *Certain improvements in the manufacture of cement.* Patent dated December 14, 1853. (No. 2900.)

*Claim.*—The manufacture of cement by calcining with breese coal, coke, or other like fuel, chalk or other carbonate of lime, and a metallic or earthy sulphate, or a sulphuret of sulphur, or a compound of sulphur or sulphuric acid, with an earthy or metallic base.

WIBBERLEY, JOHN, of Eagley, near Bolton, Lancaster, mechanic. *Certain improvements in machinery or apparatus for winding yarns or threads on to spools or bobbins.* Patent dated December 14, 1853. (No. 2901.)

This apparatus consists of a screw-spindle, at the end of which are fixed the spools or bobbins, having right and left-handed threads cut upon it working into or against metal pallets, which produce an alternate motion either to the right or left as required. These pallets are acted upon by ratchet or other wheels, on the spindle of which is fixed a box or volute spring giving motion to this part of the machine. When the yarn or thread is wound up to the shoulder of the spool or bobbin, the acting thread moves a sliding spindle bearing the pallets, and operating upon the tongues working into the ratchet-wheels, withdraws the pallet that has been governing the motion given to the spool in one direction, and forces the other pallet into contact with the reverse cut thread, and by these means causes the screw-spindle and spool to retraverse, and so on until the required number of layers are wound on.

JOHNSON, WILLIAM BECKETT, of Manchester, Lancaster, engineer. *Improvements in machinery or apparatus for making bricks and other articles from clay and other plastic materials.* Patent dated December 14, 1853. (No. 2904.)

*Claim.*—The adaptation of two or more moveable surfaces to a travelling set or sets of moulds, such surfaces being caused to advance towards each other from two or more sides of the moulds as they travel onward.

RASCOL, EUGÈNE HIPPOLYTE, of Catherine-street, Strand, Middlesex, gentleman. *Improvements in retorts for the manufacture of gas.* (A communication.) Patent dated December 15, 1853. (No. 2905.)

These improvements consist in constructing retorts of fire bricks, or blocks of fire clay properly prepared and burnt, and formed to dovetail, overlap, or interlock into each other, and are united by a cement capable of resisting the heat to which retorts are subjected.

MESSENGER, SAMUEL, of Birmingham, Warwick, manufacturer. *An improvement or improvements in railway, ship, and carriage lamps.* Patent dated December 15, 1853. (No. 2906.)

*Claim.*— The application of corrugated plates or sheets of metal to the construction of such parts of railway, ship, and carriage lamps as they are applicable to.

VIVIEN, JACQUES PIERRE HENRI, manufacturer, of Paris, France. *Certain improvements in the manufacture of paper and pasteboard.* Patent dated December 15, 1853. (No. 2909.)

A description of this invention is given on page 11 of this Number.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improvement in blasting powder for mining, and other operations of a similar nature.* (A communication.) Patent dated December 15, 1853. (No. 2910.)

This invention consists in treating a granulated composition of charcoal, sulphur, and nitre with a strong solution of the chlorate of potash, and employing the powder so prepared in an unglazed state.

CALLIER, AIGNAN BERNARD, of Paris, France. *Certain improvements in the manufacture of umbrellas and parasols.* Patent dated December 15, 1853. (No. 2911.)

*Claims.*—1. Securing the clasp used for folding the umbrella or parasol, by means of an eyelet and ferrule or rivet. 2. Attaching the corners of the fabric to the rib ends by means of one or more rivets or ferrule and fastenings, a thread, pins, or a wire, as described. 3. Certain piercing and riveting apparatus.

PASCAL, JEAN BAPTISTE, of Lyons, France. *Certain improvements in obtaining motive power.* Patent dated December 15, 1853. (No. 2912.)

*Claims.*—1. Generating instantaneously, and for each stroke of the piston only, the necessary quantity of steam by bringing the water in direct contact with the flames

and the gases produced by combustion. 2. Using a portion of the heat that would be radiated or lost by the external surface of the boiler apparatus, by constantly cooling the internal surface of the same with the water that has to be evaporated. 3. Burning, by means of a strongly heated current of air, the smoke and the oxygen and hydrogen gas which is formed in the furnace. 4. Heating the driving cylinder by means of a furnace placed under the same.

BRANSTON, FREDERICK WILLIAM, of Oak-tree-house, Clapham, Surrey. *Improvements in certain tablets, labels, and signs, or their surfaces exhibiting letters and designs.* Patent dated December 15, 1853. (No. 2913.)

These improvements consist in manufacturing tablets, &c., exhibiting letters, designs, or ornaments by the application of letter-press, or other surface printing upon glass, in gold, silver, or other lustrous material, in combination with coatings of paint and encasements or backings of cement.

WHITAKER, BENJAMIN, of Brighton, Sussex, engineer and machinist. *Improvements in the manufacture or production of useful toys.* Patent dated December 15, 1853. (No. 2915.)

The inventor makes building details of wood, or other suitable material, in the form of circles, segments of circles, squares, hexagons, octagons, &c., such details being made to present great variety of appearance by being made either of different woods or of the same wood painted or stained in different colours.

COCHRAN, ALEXANDER, of Kirkton Bleach Works, Renfrew, bleacher. *Improvements in the application of starch or other substances of a similar nature to woven fabrics, and in the machinery or apparatus employed therein.* Patent dated December 15, 1853. (No. 2916.).

*Claims.*—1. The use of an endless web on which the substance is to be spread in order to be transferred to the woven fabric. 2. A mode of transferring the starch from an endless web, or from the surface of a roller or table to the fabric to be treated, by means of elastic or inelastic surfaced pressing or squeezing rollers, hammers or beaters, or by means of brushes. 3. A mode of supplying starch to the endless web or other surface upon which it is primarily deposited and spread out by causing it to issue from the perforations of a tube placed transversely over such surface, or by expressing it with a roller or otherwise through perforations in the bottom or side of a containing trough. 4. A mode of arranging starching apparatus upon a carriage to be traversed over the fabric beneath, and so supply the starch to it; or the reverse arrangement, wherein a fabric on a table or otherwise is traversed beneath or against the starching apparatus.

BINNION, WILLIAM, of Birmingham, Warwick, manufacturer. *Improvements in carriage and other lamps.* Patent dated December 16, 1853. (No. 2919.)

*Claims.*—1. Fastening the handle to the body of the lamp by means of a spring-catch. 2. Introducing air to the lamp below a nozzle round the top of the candle. 3. Causing the air to pass out of the top of carriage and other lamps, or through openings in two concentric tubes, the openings in one tube being opposed to the unperforated part of the other. 4. The use of rectangular or nearly rectangular frame-like reflectors, external to the glass sides of carriage and other lamps.

TRANTER, WILLIAM, of Birmingham, Warwick, gun-maker. *Certain improvements in fire-arms, and in bullets and waddings to be used therewith.* Patent dated December 16, 1853. (No. 2921.)

*Claims.*—1. The application of a certain plug or stopper to fire-arms. 2. The combination of a peculiar lock with a revolving chamber. 3. Several modes described of forming and constructing bullets and waddings, so as to admit of grease being readily discharged therefrom on the explosion of the powder. 4. The formation of bullets with a hole through them in the centre.

LIMOUSIN, ANTOINE, weaver, of Paris, France. *Improvements in looms for weaving pile fabrics, and in a mode and apparatus for cutting the pile.* Patent dated December 16, 1853. (No. 2922.)

*Claims.*—1. The substitution of an elastic braided or plaited cord or string for the metallic wires used in weaving terry looped fabrics, with bar looms with brocade batten, and several modes of introducing and withdrawing the cord or string from under the former loops. 2. An arrangement for opening two sheds simultaneously in the warp, and the application of these improvements for weaving velvet, offering a terry loop on both surfaces, and also for weaving double-pieced velvet. 3. A peculiar method of placing the pile warp bobbins, allowing the application of a greater number and a greater division of the pile warp threads. 4. An apparatus for cutting the pile, and a method of leaving some parts of the pile uncut.

MEDAIL, ALPHONSE, of Paris, France. *An improved hydraulic machine.* Patent dated December 16, 1853. (No. 2923.)

The construction and use of a revolving hydraulic machine, acting by means of centrifugal force composed of a series of cones placed one inside the other.

WILLIAMS, THOMAS, of South Castle-street, Liverpool, Lancaster, gun-maker. *An improved revolving pistol.* Patent dated December 16, 1853. (No. 2924.)

The "cock" or hammer of this pistol (which is acted upon by a main spring and lever in the usual manner) is provided with a ratchet lever or pall, which causes the chambers to turn a portion of a revolution each time the pistol is cocked, by acting directly upon a ratchet-wheel attached to the revolving chambers, so as to present a fresh breech opposite to, or in a direct line with the barrel of the pistol, the lever or pall being kept always in gear by means of a feather spring. Between each nipple of the breech is a partition, against which a projecting part at the lower side of the cock or hammer acts, so as to lock the revolving chambers firmly when the pistol is cocked. The upper part of the trigger is also furnished with a projecting wedge-formed piece, which, upon pulling the trigger to discharge the pistol, locks into a groove in one of the said partitions before the trigger releases the cock, or at the same instant, so that the chambers are always held firm, and prevented from revolving except at the moment of cocking, or when the pistol is at half-cock.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MORLEY, GIDEON, of Birmingham, Warwick. *Ornamenting or producing pictures on japanned goods, panels, canvass, or other material, whereby a vast amount of artistic skill and labour is surperseded.* Application dated December 9, 1853. (No. 2870.)

The inventor first paints a suitable sky or background on the article to be ornamented, and then prints on paper, in a suitable colour, an outline of the subject to be produced, and transfers it to the article below the sky or background; the shadows, &c., are then painted, and the transferring process repeated, &c.

DUBOST, HIPPOLYTE LAURENT, of Rue Neuve des Petits Champs, Paris. *Improvements in the construction of locks and keys.* Application dated December 10, 1853. (No. 2879.)

This invention consists of an arrangement of notched slides and grooves formed on the lock and key, the motion communicated to the slides of the lock being varied according to the positions of those on the key.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in moulding more particularly applicable to tooth wheels.* (A communication.) Application dated December 10, 1853. (No. 2880.)

This invention consists of a mode of constructing moulds, by which patterns are to be dispensed with. The circular portions of wheels, such as the rims and bosses, are formed by a rotating arm, with a scraper attached to it. The spokes are formed by suitably-shaped scrapers, and the teeth by inserting small pieces of suitably-moulded clay made hollow for the rim, these pieces or cores corresponding with the spaces between the teeth.

EVANS, WILLIAM, of Myrtle-street, Hoxton, Middlesex. *Improvements in obtaining and applying motive power.* Application dated December 12, 1853. (No. 2887.)

The inventor constructs a piston having two separate hollow conical-shaped chambers placed opposite to each other, and to these connects pipes, into each of which alternately is admitted water, steam, air, or other fluid, direct from its source. The piston thus constructed is fitted into a frame, which slides in a cylinder, in which a vacuum is always maintained; the ends of the cylinder being closed for that purpose, and the pipes which are attached to the chambers of the piston work air-tight through stuffing-boxes in the cylinder ends.

GUESDRON, ANDRE GASPARD, of Montmartre, Paris, France, merchant. *An improvement in, or addition to sugar-basins.* Application dated December 13, 1853. (No. 2893.)

This invention consists in constructing a sugar-basin, which registers the quantity of sugar placed in or taken out from it.

GUESDRON, ANDRE GASPARD, of Montmartre, Paris, France, merchant. *A method of producing plans in relievo.* Application dated December 13, 1853. (No. 2894.)

This invention consists in forming plans in relief on inflated caoutchouc sheets.

KING, RICHARD JAMES NORMAN, of Exeter, dentist. *An improved artificial bait for fish.* Application dated December 14, 1853. (No. 2902.)

This invention consists in forming a brass model of a minnow with hooks soldered to the side of it, and bound by gut or silk.

PARROCK, ROBERT, of Glasgow, Lanark, North Britain, tailor. *Improvements in coats and similar articles of dress.* Application dated December 14, 1853. (No. 2903.)

The inventor proposes to form the breast and side of the skirt of a coat in a single piece, and to adopt analogous methods in cutting out other articles.

PUGH, THOMAS, and WILLIAM KENNARD, both of King-street, Snow-hill, London, ironmongers. *Improvements in locks and latch-spindles.* Application dated December 15, 1853. (No. 2907.)

This invention consists in constructing the spindles of locks and latches of two or

more bars or pieces, and also in forming such spindles so that they may slide upon each other for the adjustment of the handles to the different thicknesses of doors.

HOWELL, JOSEPH BENNETT, of Sheffield, York, steel manufacturer, and JOHN SHORTRIDGE, also of Sheffield, York, gentleman. *An improvement or improvements in the helves of tilt-hammers.* Application dated December 15, 1853. (No. 2908.)

This invention consists in forming the helves of tilt-hammers of blocks or bars composed of layers of skins suitably treated.

MORRIS, CHARLES JOHN, of Kirby-street, Hatton-garden. *Certain improvements in bookbinding.* Application dated December 15, 1853. (No. 2914.)

This invention consists in the use of two bent levers of the second order for holding the books operated upon, the face of the shorter and bent end of each being curved to suit the curvature of the back of the book. The fulcra of these levers consist of two V-shaped pieces of steel, which are adjusted in the framing of the machine so as to suit books of different sizes, and the levers are retained in their proper position by springs.

GIBORY, FERDINAND DENIS, of Paris, France. *Improvements in instruments for ascertaining heights and distances, and for levelling.* Application dated December 15, 1853. (No. 2917.)

This invention consists in constructing a disc circumscribed by a ring, to which are applied a pointer and three eye-pieces, two of which are fixed while the other is moveable, for the purpose of being directed to different parts of the circumscribing ring.

REDFORD, ARTHUR BENJAMIN SAMUEL, of Albion-place, Walworth-road, Surrey, printer, and THOMAS CLOAKE, of Saville-row, Walworth-road, same county, watchmaker. *Improvements in retarding and stopping the progress of railway carriages.* Application dated December 15, 1853. (No. 2918.)

The inventors furnish each carriage with a rod which runs under the flooring, and is fitted with screw threads or worms which, when motion is imparted to the rod by the ordinary guard's hand-wheel and gearing, will force the breaks against the peripheries of the wheels of the carriage.

WHITEHEAD, WALTER GEORGE, of Birmingham, Warwick, accountant clerk. *An improvement or improvements in hats, caps, bonnets, and other coverings for the head.* Application dated December 16, 1853. (No. 2920.)

This invention consists in the introduction into hats, caps, bonnets, and other coverings for the head, of such combinations of metals or other materials as shall form with the moist skin during the wearing of them a voltaic or galvanic combination, and develope a current of electricity, to cure or relieve head-ache or other nervous affections in the head of the wearer.

TRUSS, THOMAS SEAVILLE, of Cannon-street, London, mechanical engineer. *Improvements in breaks for railway-carriages and other vehicles.* Application dated December 16, 1853. (No. 2925.)

This invention consists in an arrangement of drums or axles, levers, and straps for working breaks.

TRUSS, THOMAS SEAVILLE, of Cannon-street, London, mechanical engineer. *Improvements in apparatus for communicating between the engine-driver and the guard of railway-trains.* Application dated December 16, 1853. (No. 2926.)

The inventor places a coil spring on the flat surface of the framing of the carriage by means of a washer or a weight, the other end of the spring being bolted to the frame, a small pulley being also placed on the shaft; an India-rubber or flexible pipe from a pair of bellows passes along the rim of the tender to the edge of the foot plate close to the engineer, the end of the pipe nearest him having one or more whistles, and being of sufficient length to be strapped to him.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in dyeing.* (A communication.) Application dated December 16, 1853. (No. 2927.)

"This invention consists in the employment of a new chemical compound to be used in place of tartar, which has hitherto been considered indispensable in dyeing wools, and also merinos and other fabrics. The new compound is composed of sulphate of alumina, salt of soda, and sulphuric acid, and forms a most effective mordant."

## PROVISIONAL PROTECTIONS.

*Dated May* 18, 1854.

1106. Thomas Chambers Hine, of Regent street, Nottingham, architect. A new method of applying glass in the ornamentation of chandeliers and other fittings required for gas, candle, oil, or other artificial light.

*Dated May* 29, 1854.

1190. Andrieu Ernest Sablons, of South-street, Finsbury, London, civil engineer. Certain improvements in the construction of trunks, travelling boxes, portmanteaus, and other similar receptacles.

*Dated May* 31, 1854.

1203. Thomas Harrison, gentleman, and Elisha Harrison, mechanic, both of Blackburn, Lancaster. Improvements in looms for weaving.

1205. George Alfred De Penning, of Calcutta, civil engineer. An appendage to screw propellers.

1207. Abraham Rogers, coal proprietor and miner, Beeston Royds, near Leeds, York. Improve-

ments in the mode of ventilating mines, sewers, and other subterranean works, and likewise for the warming and ventilating of all kinds of public buildings.

1211. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of manufacturing soluble silicates. A communication.

*Dated June* 1, 1854.

1213. John Whitaker, cotton-spinner, and James Pickles, manager, both of Todmorden, York. Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, or other fibrous substances.

1215. Charles King and Edward Sutton Benfield, both of Chenies-street, Middlesex, wood-carvers. Improved machinery for cutting and carving wood, stone, and other materials.

1217. James Timmins Chance, of the Glass Works, near Birmingham, Warwick. Improvements in machinery for roughing or preparing the surfaces of glass. A communication.

1219. Joseph Robinson, of Denton-mill, Carlisle. Improvements in apparatus for mixing wheat and other grain and matters.

1221. George Kenedy Geyelin, of Camden-town, Middlesex. Improvements in furnaces and fire-places for facilitating the consumption of smoke.

*Dated June* 2, 1854.

1223. Charles Maschwitz, of Birmingham, Warwick, merchant. A new or improved instrument for paring and slicing apples, potatoes, and other fruits and roots. A communication.

1225. Edward Orange Wildman Whitehouse, of Brighton, Sussex, surgeon. Improvements in effecting telegraphic communications.

1229. John Mason, of Rochdale, Lancaster, machinist, and Louis Christian Koeffler, of the same place, dyer and bleacher. Improvements in scouring, and in washing wool, hairs, and yarns, and in machinery or apparatus for effecting the same.

*Dated June* 3, 1854.

1231. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved fuel. A communication.

1233. Thomas Lenox, of Pigott street, Limehouse, Middlesex. A novel mode of reefing topsails, jibs, and other sails, from the decks of ships whilst at sea.

1235. Absalon Hippolyte Leplay, chemist, of Douvrin, Pas de Calais, France. Certain improvements in extracting and manufacturing the alcohol of beetroot, and of other sweet matters or tubers.

1237. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in breech-loading fire-arms. A communication.

1239. Abel Franklin Goodnow, of New York, United States of America. An improvement in scythe snaths, or the manufacture thereof. A communication.

1241. Alfred Garratt Barham, of Bridgewater, Somerset, gentleman. An apparatus for damping or moistening the adhesive surfaces of stamps or labels.

*Dated June* 5, 1854.

1243. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improvement in screw propellers. A communication.

1245. George Garbert, of Port Louis, island of Mauritius, engineer. Improvements in the construction of buildings.

1247. Napoléon Néron, of Rue St. Lazare, Paris, France, gentleman. Improvements in muskets, carbines, fowling-pieces, and other fire-arms. A communication.

1249. Andrew Spottiswoode, of New-street, St. Bride's, London. Improvements in the manufacture of fuel.

1251. Thomas Spiller, of Red Lion-square, Holborn, Middlesex. Improvements in propelling carriages when atmospheric air is used.

*Dated June* 6, 1854.

1253. William James Baillie, of Southwark, engineer. An improved mode of propelling ships and other floating vessels.

1255. John Nicholson, of Blackwall, Middlesex, engineer. An improved ratchet screwing and drilling stock, which may also be used as a spanner.

*Dated June* 7, 1854.

1258. John Mansfield, of Stoke, Stafford, engineer and millwright. An improvement or improvements in steam boilers.

1259. Charles Anthony Perpigna, advocate, of Paris, France. Improved apparatus for effecting the combustion of smoke in fire-places. A communication.

1260. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved manufacture of bonnets and other coverings for the head. A communication.

1261. Peter Hindle, of Ramsbottom, Lancaster, manufacturer. Certain improvements in power-looms for weaving.

*Dated June* 8, 1854.

1262. John Wilson, of Albert-place, High-street, Stratford, Essex. An improved pump, applicable to mines, wells, ships, fountains, and domestic purposes, and raising melted metals in foundries, so constructed that it cannot lose water, draw grit, draw air, or freeze.

1263. Joseph Kaye, of Beeston, near Leeds, York, spinner. Certain improvements in machinery or apparatus for slubbing, roving, spinning, and doubling wool and other fibrous materials.

1264. William Alldritt, of Belfast, Antrim, Ireland, brassfounder. Improvements in lighting and ventilating.

1265. Michael Scott, of Great George-street, Westminster, civil engineer. Improvements in roofing or covering reservoirs or holders for liquids.

1266. James Leadbetter, of Halifax, York, brasier, and William Wight, of the same place, plumber, and Thomas Davis, of the same place, auctioneer. Improvements in machinery or apparatus for raising water and other fluids.

1267. Joseph Skertchly, junior, of Kingsland, Middlesex, and Ansty, Leicester, engineer. Improvements in the manufacture of gates, hurdles, and fencing, in vehicles, wagons, carts, and trucks, for common roads and railways, and in facias, entablatures, window-headings, parapet, and other mouldings projecting from the brickwork of buildings.

1268. Pierre Journet, of Rue de Belzunce, Paris. Improvements in chucks for lathes.

1269. Bewicke Blackburn, of Clapham-common, Surrey. Improvements in the manufacture of pipes when applying slate for such purposes.

1270. Thomas Richardson, of Portland-place, Newcastle-on-Tyne. Improvements in the manufacture of alum.

*Dated June* 9, 1854.

1271. Jean Baptiste Numa Erard, of Paris, France, gentleman. Improvements in the preparation of paint.

1272. Frédérique Margueritte, of Paris, France. Improvements in wet gas-meters.

1273. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in machinery for cutting brads, lath nails, and others of similar character. A communication.

1274. Thomas Bramwell, of Enfield-house, near Gateshead-on-Tyne, Durham. Improvements in the manufacture of the carbonates and prussiates of potash and soda.

1275. John Nelson, of Selby, York, and David Boyd, of the same place, flax-scutchers. Improvements in preparing and scutching flax, hemp, and other substances.

1276. James Lamb Hancock, of Neath, Glamorgan, medical practitioner. An improvement in cutting hay, straw, and other fibrous articles and substances.

1277. John Currie, of Glasgow, Lanark, North Britain, miller, and Robert Young, of the same place, engineer. Improvements in the treatment and grinding of grain, and the products thereof.

1278. Benjamin Cook, of Birmingham, Warwick, manufacturer. Certain improved means of ornamenting metallic bedsteads, chairs, and couches, which said improvement is also applicable for ornamenting standards for glass frames, tables, and fire-screens, cornice-poles, and other articles of furniture.

1280. Gustav Adolph Buchholz, of Hammersmith, Middlesex, civil engineer. Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.

*Dated June* 10, 1854.

1282. Arthur Llewellyn Dawson, of Southwark-bridge-road, Surrey, engineer. Improvements in machinery for cutting and shaping wood.

1283. Andrew Barclay and John Barclay, both of Kilmarnock, Ayr, engineers. Improvements in printing textile fabrics and other surfaces.

1284. Louis Bois, stockholder, of Paris, France. Certain improvements in looms.

1285. John Whitehead, of Preston, Lancaster, agricultural-implement maker. A machine for weaving wire-netting of iron, brass, or other material. A communication.

1286. Edwin Powley Alexander, of Lincoln's inn-fields, Middlesex, mechanical draughtsman. Improvements in moulding. A communication from M. De Louvrié, of St. Marc, France, engineer.

1287. Francis Puls, of Whitechapel-road, philosophical-instrument maker. Improvements in electro galvanic apparatus for medical purposes, parts of which improvements are also applicable to other electro-galvanic apparatus.

*Dated June* 12, 1854.

1288. John Young, of Wolverhampton, Stafford, manufacturer. Improvements in locks and latches.

1289. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. A method of producing plans in relievo. A communication.

1290. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improvement in or addition to sugar-basins. A communication.

*Dated June* 13, 1854.

1291. Antoine Louis Péter, of Lyons, France. Improvements in treating a certain kind of indigo.

1292. Charles Henry Compton, of Bloomsbury, Middlesex, gentleman. An improved railway-break.

1293. William Southall, of Swan-lane, London, gentleman. Improvements in machinery or apparatus for cultivating and pulverizing land.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 27th,* 1854.)

341. George Ayres. An improved clip or file for holding papers or other articles.

379. Thomas Telford Macneill. Improvements in drying flax, straw, and other organic substances.

386. Robert Holt. Certain improvements in machinery or apparatus for manufacturing bricks and tiles.

395. John Reed Hill. Improvements in machinery for pulverizing metallic ores, or other similarly hard substances.

413. Stopford Thomas Jones. Improvements to reduce and wash minerals to extract metal therefrom, especially gold.

417. James Smith. Improvements in ornamental weaving.

421. Anthony Bernhard Baron Von Rathen. Improvements in omnibuses for the purpose of adapting them to be drawn by one horse, and to be attended by one man only.

432. Thomas Settle and Peter Cooper. Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous materials.

433. Adolphus Oppenheimer. Certain improvements in the manufacture of mohair velvet, or mohair plush.

436. Charles Walker. Improvements in purifying water for steam boilers.

463. Constant François Bekaert. Improvements in linseed oil for painting, called "oxigenated oil." A communication.

479. Frederick Samson Thomas. A new rifle carriage.

480. Ellis Marsden and John Marsden. Improvements in pumps.

562. James Smith. Improvements in baking ovens.

598. Laurence Whitaker, John Diggle, and George Howarth. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

651. Edouard de Mars. Certain improvements in windlasses or capstans. A communication from Ferdinand Femé, of the French Imperial Navy.

976. James Hamilton. Improvements in machinery for crushing quartz and other substances.

1040. Pehr Ambjorn Sparre. An improved mode of preventing the alteration or falsification of written documents.

1146. William White. Improvements in hats and in hat blocks.

1166. Edouard Carl Mantrand. Improvements in the manufacture of phosphorus.

1180. Joseph Hipkiss. An improvement or improvements in puddling furnaces used in the manufacture of iron.

1190. Andrieu Ernest Sablons. Certain improvements in the construction of trunks, travelling-boxes, portmanteaus, and other similar receptacles.

1217. James Timmins Chance. Improvements in machinery for roughing or preparing the surfaces of glass. A communication.

1228. Isaac Taylor. An improvement in producing thin metallic shells adapted to printing.

1231. Peter Armand Lecomte de Fontainemoreau. An improved fuel. A communication.

1234. Peter Armand Lecomte de Fontainemoreau. Improvements in producing a useful substitute for leather in various applications. A communication.

1237. William Edward Newton. Improvements in breech-loading fire-arms. A communication.

1239. Abel Franklin Goodnow. An improvement in scythe snaths, or the manufacture thereof. A communication.

1242. James Bowman Lindsay. A mode of transmitting telegraphic messages by means of electricity through and across a body or bodies of water.

1243. Richard Archibald Brooman. An improvement in screw-propellers. A communication.

1253. William James Baillie. An improved mode of propelling ships and other floating vessels.

1254. William Thomas Parkes. An improvement or improvements in the manufacture of the ornamental parts of gas-fittings.

1255. John Nicholson. An improved ratchet screwing and drilling stock, which may also be used as a spanner.
1276. James Lamb Hancock. An improvement in cutting hay, straw, and other fibrous articles and substances.
1285. John Whitehead. A machine for weaving wire netting of iron, brass, or other material. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

### WEEKLY LIST OF PATENTS.

*Sealed June* 23, 1854.

2993. Joseph Lewis.
2995. Thomas Williams Makin.
2996. Edward Joseph Hughes.

1854.

15. John Isaiah Grylls.
61. William Littell Tizard.
121. Edmund Sharpe.
137. Henry Bollman Condy.
138. Edward Aitchison.
151. Herman Eugene Falk.
858. Robert Whiteside.
859. William Coltman.
894. Henry Hucks Gibbs.
910. Henry Brown.
923. Aimé Blavier.

*Sealed June* 24, 1854.

2991. Harris Hardinge.

*Sealed June* 27, 1854.

2999. Samuel Sedgwick and Thomas Dawson.
3000. Thomas Symes Prideaux.
3007. Richard Green.
3020. Claude Alphonse Roux.

1854.

4. James Gowans.
39. Anthony Bernhard Baron Von Rathen.
67. Felix Lieven Bauwens.
85. John Henry Johnson.
94. Julius Jeffreys.
175. George Williams.
224. Benjamin O'Neale Stratford, Earl of Aldborough.
270. Robert Brockman Newhouse.
383. George Smith, junior.
424. William Edward Newton.
462. James Keenan.
553. William Isaac Cookson.
625. Thomas William Keates.
761. Richard Edward Hodges.
826. Thomas Bromley.
839. Alfred Sohier Bolton and Francis Seddon Bolton.
871. Henry Meyer,
896. William Denton.
955. John Henry Johnson.
978. John Clarke.
997. William Hyde Knapp.
999. Edward Barlow, William Johnson, William Slater, and Peter Knowles.
1005. Frank Clarke Hills.
1009. Joseph Wonfor.
1014. Bernard Joachim La Mothe.
1016. Bernard Joachim La Mothe.
1086. Frederick East.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

### LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| June 9 | 3598 | B. Newnham | Bath | Noiseless carriage-spring. |
| ,, | 3599 | J. P. and E. Westhead and Co. | Manchester | Thread-hoop. |
| 12 | 3600 | J. Greenham | Blankney, Lincolnshire | Harrow. |
| 15 | 3601 | F. Lack | Strand | Wristband. |
| 19 | 3602 | T. J. and J. Smith | Queen-street, Cheapside | Postage-damper. |
| 22 | 3603 | T. Cowburn | Bolton-le-Moors | Safety-valve. |
| 24 | 3604 | F. J. Jones | Addle-street | Brace. |
| 29 | 3605 | W. Andrews | Dublin | Teapot. |
| 29 | 3606 | J. Nowill and Son | Sheffield | Pencil-knife. |

### LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| June 7 | 584 | S. Starkey | Clapton | Garden-engine. |
| 9 | 585 | Knight and Co. | Cheapside | Cosmorama-lens. |
| 15 | 586 | C. Crickmay | Birmingham | Cartridge. |
| ,, | 587 | T. Rudd | Pimlico | Cask-stand. |
| 26 | 588 | Barnard and Bishop | Norwich | Poultry-feeder. |
| 28 | 589 | C. H. Chadburn | Liverpool | Camera. |

## NOTICES TO CORRESPONDENTS.

*R. Holden.*—We have no doubt that a better knowledge of mechanical drawing may be acquired from a careful study of the "Engineer and Machinists' Drawing Book" than from the lessons of many who profess to teach the subject. But it should be remembered that no book can possibly convey a perfect knowledge of all the practical details; these may, however, be overcome by thoughtful and persevering application.

*T. L.*—We shall probably furnish accurate information concerning the gun-boats for the Baltic, now in course of construction, in our next Number.



## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1613.] SATURDAY, JULY 8, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## SCHLESINGER'S PATENT MACHINERY FOR MANUFACTURING PAPER PULP FROM WOOD.

Fig. 1.

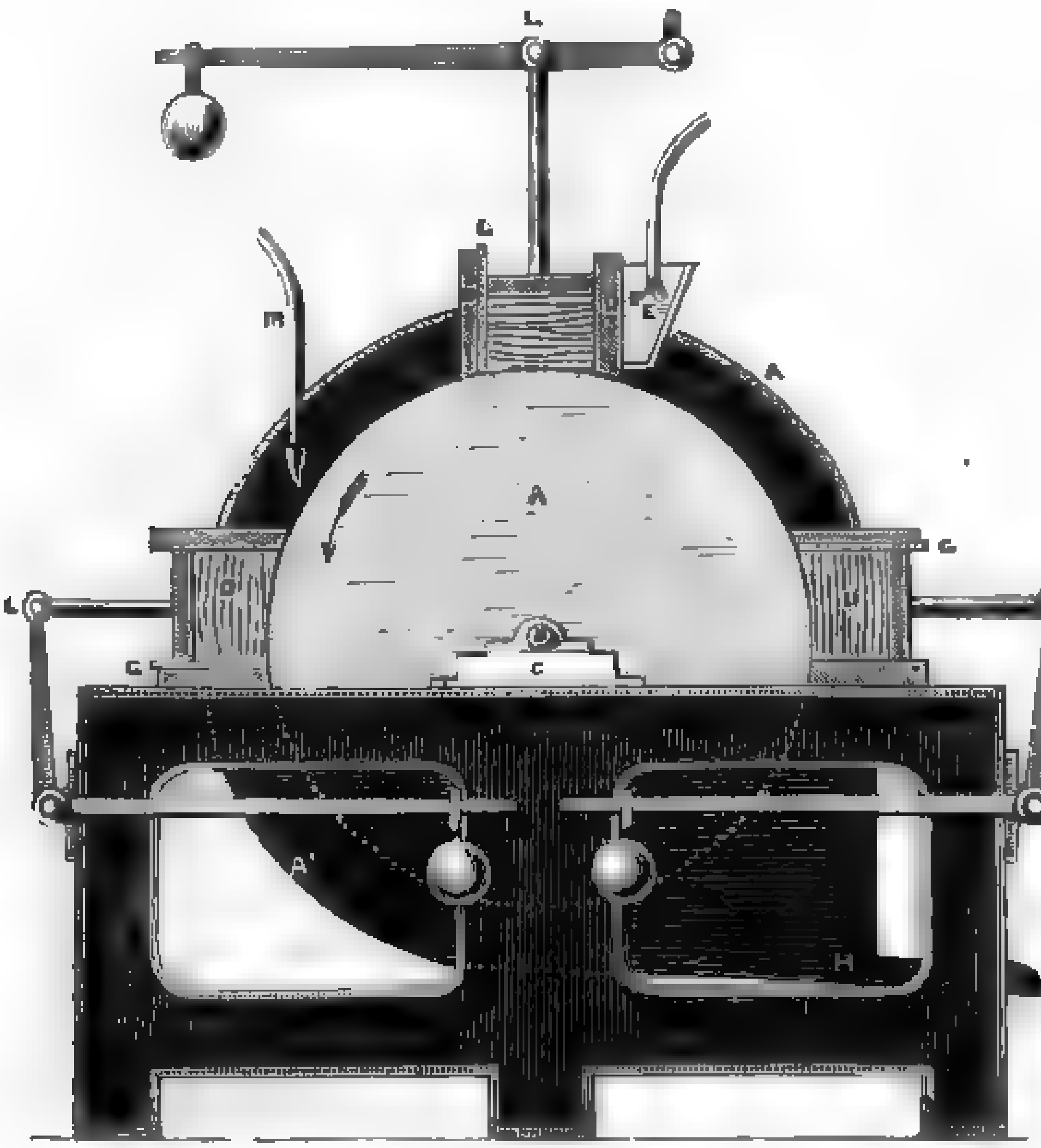
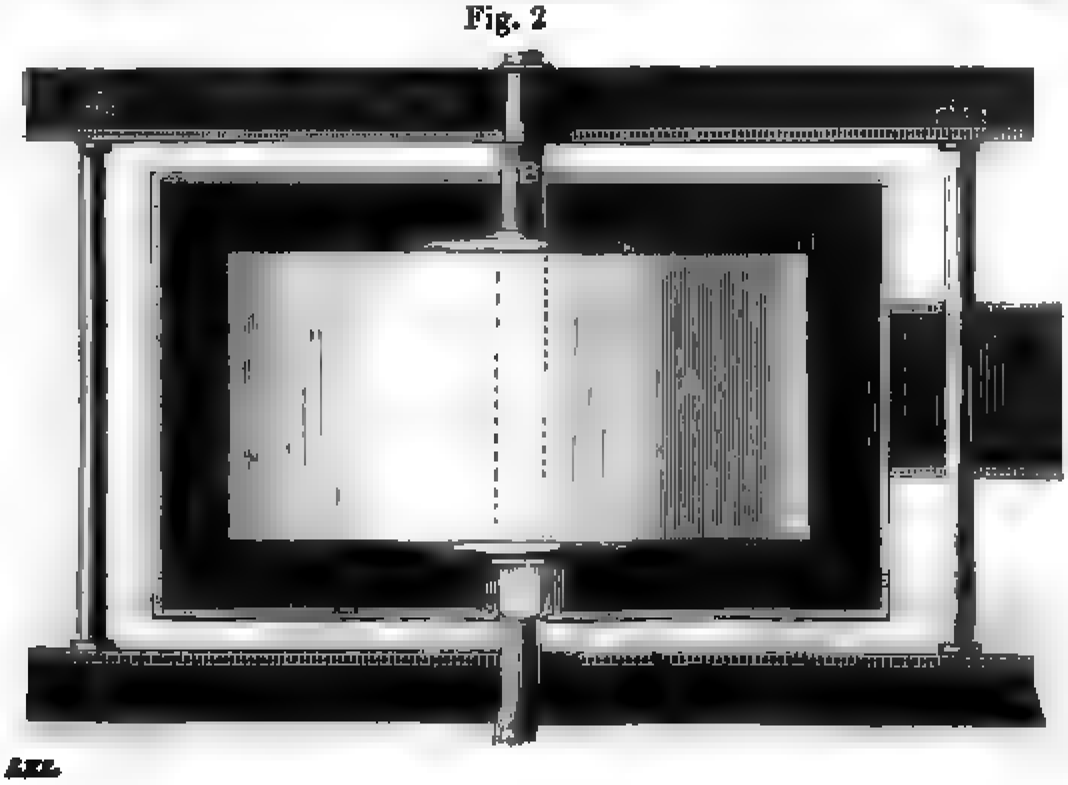


Fig. 2



## SCHLESINGER'S PATENT MACHINERY FOR MANUFACTURING PAPER PULP FROM WOOD.

A VERY excellent method of manufacturing paper and pasteboard pulp from wood, originally invented by M. Hartmann, has been improved upon by Mr. Schlesinger, of Bradford, who, after taking much trouble to introduce the plan into this country, is now, as the working partner of the inventor, conducting the process with great success. As the manufacture of paper is a subject at present forcing itself upon public attention, we think it right to give prominence to every good improvement relating to it.

Fig. 1 of the engravings on the preceding page represents a vertical section, and fig. 2 a plan of the wood-pulping machine. A is a grindstone with roughened surface, turning in the direction indicated by the arrow. B the axis, turning on bearings, C, which rest on an iron frame. A¹ a wooden casing, in which the stone turns, provided with an outlet, H, for the pulp. D boxes without bottoms, to hold the blocks of wood. I the levers pressing the blocks of wood against the grindstone. G steel gauges fixed inside the boxes, D, brought quite near to the stone, in order to prevent large particles of wood from escaping. F a perforated compartment to receive the water required to wet the stone. M a pipe through which a narrow stream of water is carried to the stone, to free it of the pulp, and carry it off along the sides. H an outlet for the pulp and water.

*Process.*—Cut a tree—say 6 feet long and 2 feet diameter—into nine lengths of 8 inches by 2 feet diameter each, place these blocks into the boxes, D, with the fibres running in the same direction as the stone turns, lever them, then start the stone at the rate of about two hundred revolutions per minute.

By the foregoing process a fibrous pulp is obtained equal to that of ordinary rag-pulp, and lower in price. Moreover, this wood-pulp has the advantage of absorbing a greater quantity of mineral than ordinary rag-pulp, without deteriorating the strength of the pasteboard or paper. Light or hard woods will take the dye of even the most delicate colours as readily as rag-pulp.

By trial made, the following articles can be produced to advantage:—1. Best quality of shop papers with a mixture of 70 to 80 per cent. of wood-pulp and 20 to 30 of rag-pulp. 2. Common packing papers with 50 per cent. of wood-pulp. 3. Cap papers with 70 to 90 per cent. of wood pulp. 4. Merchants making-up paper, up to the best canary quality, with from 40 to 60 per cent. of wood-pulp. 5. Paper-hanging for printing with 80 per cent. and all wood. 6. Printing papers—common cartridge with 20 per cent. of wood pulp, without materially deteriorating the colour of millboards, superior even to any ordinary quality, pronounced to be better adapted for jointing steam-pipings, &c., made of all wood-pulp. 8. Press paper, which stands the strongest test of heat, with 60 to 75 per cent. of wood-pulp. 9. Pasteboard of the very best quality with 60 per cent. of the lower qualities up to 100 per cent. of wood-pulp. (A quality made of 75 per cent. wood and 25 per cent. rag-pulp was tried for Jacquard cards, and stood the test of both heat and damp.)

According to Mr. Schlesinger's calculation, he produces a pound of *dry* wood pulp at about one penny, and makes no doubt that, in districts where wood and power can be had cheaper than at Bradford, it may be made at five-eighths to three-fourths of a penny per pound of dry pulp. The cheapest classes of wood, as fir, pine, poplar, willow, &c., suit his purpose best.

We have had highly satisfactory specimens of the papers and pasteboards above enumerated submitted to our inspection.

## STEAM GUN-BOATS FOR THE ROYAL SERVICE.

WE are never very ready to join in popular outcries against the heads of public departments. Such complaints more commonly arise from folly than from wisdom, and prove that many individuals are far more willing to babble about things of which they are ignorant, than to put themselves in possession of accurate information. We are, nevertheless, disposed to consider the present deficiency of steam gun-boats in the gulfs of the Baltic as an unnecessary evil, and one which appears to have been wantonly encountered. The nature of the service to be performed in that sea was well understood from the commencement of the war, and it is certain that the construction of a gun-boat flotilla could not have been a formidable task for a power that has sent forth such a steam fleet as that which now menaces Cronstadt. And yet all that has been completed to meet the exigencies of the service in the shallow waters of the North is comprised in the ordinary supply of launches, pinnaces, cutters, &c., to the ships of our fleet, and the equipment of a few crazy little steam-boats that have encumbered our principal naval ports for several years past.

At last, however, a slight movement has been made in this matter, which we will here describe, in order to remove the absurd statements and conjectures that have gone abroad concerning it. Six despatch gun-vessels are now in course of construction, four of them at the yard of Messrs. Mare and Co., Blackwall, and two of them at the yard of Messrs. Green, Poplar. The tonnage of each of these vessels is 476 tons (old measurement); the length between the perpendiculars, 160 feet; the breadth extreme, 25 feet 4 inches; the greatest draught of water, 11 feet 4 inches. They are to be fitted with engines of 160 nominal horse-power, having two boilers, one above and the other below the water-line; the lower one alone to be used when the vessel is in action. The diameter of their screw-propellers is 11 feet. These vessels are intended to be capable of travelling at a very considerable speed, when under full steam-power, and are each to be furnished with three masts fitted with fore and aft sails, carrying no topsails of any kind. They are to carry two ten-inch pivot-guns and *four* 32-pounders; not *six*, as has been erroneously stated in some journals. That these vessels cannot navigate waters of a depth of seven or eight feet only, the Surveyor of the Navy is doubtless aware, although several newspaper correspondents have proffered the information to him publicly. It is plain that they are intended to form a class of vessels which, although inefficient for much of the Baltic service, will nevertheless be found extremely useful accessories to Admiral Napier's fleet.

The construction of the vessels really intended for service in the shallowest navigable waters on the coasts of Finland and Russia has been *very lately* commenced in the Royal Dockyard, Deptford, and at Mr. Pitcher's yard, Northfleet. These are to be shorter, stronger, and of less horse-power than those just described, are to be fitted with high-pressure engines, and are to draw but little more than *six feet* of water. They are to have lateen sails fitted on three masts, which are to be made to unship if necessary, so that nothing may show above the gunwale when they are in action. Their burden is to be 215 tons, and their length between the perpendiculars 100 feet. Their scantlings or timber dimensions are to be larger than those of the despatch boats. These also are to be fitted with screw-propellers, which will have to work at very high velocities. Were the present not a time in which it would be both hopeless and impertinent to suggest to the Admiralty the propriety of experimenting, we should certainly seek to call their attention to a propeller more suitable than the screw to the propulsion of shallow vessels. We allude to that patented recently by Mr. Wilding, and described at page 313 of our last Volume, which might be made of a much greater diameter than the screw, for the same vessel,—since it may be placed in any inclined position, which the screw, of course, cannot.

To the above remarks it may be proper to append the following propositions of Captain Shuldham, R.N., extracted from a pamphlet which has just been published by that officer, and which we shall notice at length in an early Number:

"Such an economical plan as I have described might also be advantageously adopted for our coast defences, by having steam gun-boats or vessels of various tonnages, in proportion to the importance of the several ports they were intended to protect.

"In order that these vessels should be manned with the shortest complement of hands, they should have no masts whatever, their locomotion depending entirely on screw propulsion. I propose that they should consist of two classes: the small class to be fitted with only one gun, to be placed amidships on a traversing carriage, to enable it to be pointed in any direction, and sufficiently elevated for it to be depressed enough without injuring, when fired, the vessel's head or stern. When the gun was directed towards the latter, the helmsman would have to shift his berth to the head of the vessel, where would be a steering apparatus connected with the rudder abaft, for him to steer by. If this one-gun battery were contrived to work round the funnel as its centre, there would then be *no direction* in which the gun could not be fired. The one-gun boats might be of various tonnages, according to the weight of the gun, from a 12-pounder to a 68, and to the importance of the port which sheltered them. As these vessels would require but very few hands to fight and navigate them in addition to the stokers, they might, when required upon any particular service, be assisted by the coast-guard men, in addition to their permanent crew, which latter should be at its minimum—that is, only two men besides the stoker or stokers—in addition to the officer who had charge of the vessel, either a lieutenant, mate, or midshipman, as might be judged best, according to the tonnage of the respective vessels. Thus, there would be just a sufficient permanent establishment to keep the vessel in a proper state of order and cleanliness, and ready to execute any service on which she might be ordered. No harbour along the coast capable of sheltering this class of vessel should be without one; and, wherever it was prac-

ticable, she should be so moored and placed as to be capable of firing her gun when she was aground, thus preserving its use as a land battery when the tide was out.

"The armament of the first-class steam gun-boat should consist of three guns on traversing platforms, one amidships, one forward, and the other aft; the tonnage of the said vessels to be also in proportion to the weight of their guns. I think that four men, in addition to the commanding officer and stokesmen, would be an ample permanent establishment for this class of vessel, with whatever assistance might be required from the coast-guard. The largest class would require about eight hands for its permanent crew, and the intermediate sized vessels in proportion. To account for such small establishments, it must be borne in mind that all the heavy work would be done by steam power, and there would be very little work, as the respective vessels would be at moorings in the ports to which they belonged; and unless they anchored in other ports or roadsteads, there would be no heavy work at all. This large class would of course be for the protection of the more important ports.

"Both these classes of vessels might, at a minimum cost of establishment, be kept up all along our coasts; and besides their being in a constant state of readiness to defend them, they would be found very useful in succouring vessels in distress and towing life-boats to shipwrecked vessels, and performing more effectually many of the duties now done by coast-guard men in open boats, should the increased expenditure of coals for those duties not be objected to.

"Should the two classes of steam gun-boats which I have described be found to answer, the system might be carried still further—to what might really be termed floating batteries, on a still larger scale—viz., with a whole tier of guns of different calibres, according to the tonnages of the vessels. With such resources it is quite clear, that in case any enemy dared to insult our otherwise defenceless coasts, in a short space of time a great number of steam gun-boats, or floating batteries, would be collected, to chastise him in whatever part of the coast he was committing his depredations. In the present state of our defences, how many ports are there which are so miserably protected, that a single steam-ship might insult with impunity. As an instance, whilst I am now writing at Portishead, within gun-shot of King's-road, there are riding at anchor several valuable merchant ships, which might all be easily destroyed, if not captured, by a war steam-vessel, there not being a single gun mounted to prevent her; indeed, such is the defenceless state of the Port of Bristol, that I think it even possible for an armed force to proceed up the Avon, and set fire to all the shipping there; whereas, a few guns mounted on some of the salient points of such a winding and narrow river would prevent the possibility of such a catastrophe. The port in question is so easily defended, that that may be the reason of its not being defended at all.

"In case the first cost of the steam gun-boats should be judged too great, I have a plan of a sailing gun-boat armed with one gun amidships, which is capable of being directed to any point, quite clear of the sails, mast, and bowsprit; but I am far from recommending such vessels in preference, and it is only for economy (should there be any) that I have mentioned them. Steam is still so much in its infancy, that we have yet to learn by experience the length of time marine steam-engines will last, so as to be able to make a comparative statement of their wear and tear, with that of masts, rigging, and sails. It may be therefore that the annual cost of steam-engines when seldom used, with stokers to keep them in proper order, would not be so great as the wear and tear of masts, rigging, and sails would be, the comparison being made with steam-vessels without any masts whatever, against sailing-vessels without steam power, on the supposition that the former would be seldom employed, and therefore the expenditure of coals very trifling. In whichever of the two the greatest economy might be found, the preference in regard to efficiency must be given to steam gun-boats. It is true that the first cost of them would be great, supposing that the whole force were to be brought forward at once. Some of the smaller one-gun vessels might be tried by way of experiment, and stationed in some of our small ports which have no guns to defend them, and if they answered well the intended purpose, the force might be gradually augmented and improved.

"These gun-boats should combine three principal qualities, viz., great speed, gun or guns easily worked, and the cost of their establishment brought to a minimum. The first would be easily obtained, because the carrying tonnage of the vessel would be so trifling, and consequently the immersion of her body so little, in comparison to sea-going steamers, consisting only of her armament, the weight of her engines and boilers, together with the small amount of coals, provisions, and water, she might require for a short trip.

"We have so many officers on half-pay, that I have no doubt that many of them would volunteer to command such gun-boats rather than remain idle.

"The small class of gun-boats would be

found useful for the coast-guard men to be taught gunnery practice both in smooth water and in a sea way, much more advantageously than on shore. Those gun-boats which were stationed in bar-harbours could, on a flood tide, when afloat, proceed to sea, and return after a two hours' practice; by such means the coast-guard men would become the most expert sea gunners, and of course the more valuable when drafted into Her Majesty's ships.

"Although I propose, for the sake of greater economy, and for the facility of directing the gun upon every point, to dispense with masts and sails, nevertheless I would keep one mast and sail in reserve, in case a sail should be wanted to steady the vessel in a gale, or to be used when the steam machinery was disabled; but otherwise the mast would be struck by a convenient method, so that no obstruction would hinder the gun from being directed to any desirable point.

"By way of advocating more strongly the employment of the force in question, I will suppose an enemy's frigate running along our coast from Orfordness to Sunderland, for the purpose of destroying all the coasting vessels she might meet. Let me ask if such a calamity could be prevented in the present defenceless state of our ports and coasts?

"But with the aid of coast telegraphs numerous gun-boats could, in a short space of time, be collected to surround her, to cripple her, or at least to withdraw her attention from her destructive work. Such an encounter would prove the necessity of the gun-boats being built to obtain great speed, so as not to be individually taken or run into by their powerful opponent. Gun-boats should be able to choose their positions, more especially those which are feebly manned, according to my economical system.

"It is not for me, but for official power, to be the best judge regarding the mode of manning the steam gun-boats which I have proposed; but it appears to my mind, that they might be under the direction of the coast-guard, who might then be all afloat instead of on shore, whenever an enemy appeared off the coast, as their services would be much more useful at sea than in manning the batteries on shore, and more natural and congenial to their feelings to have a fight afloat.

"I may here observe, that if the said gun-boats were not constructed (according to my economical system) to carry as little weight as possible, comparative greater speed could not be expected of them. So it may be said in this case, that economy begets speed."

## ON SOME PHENOMENA CONNECTED WITH THE MOTION OF LIQUIDS.

In a paper recently read at the Royal Institution on the above subject by Professor Tyndall, the lecturer commenced by referring to certain phenomena exhibited by liquids, and at variance with our commonly received notions as to their non-cohesive character. According to Donny, when the air has been as far as possible expelled from water by persistent boiling, such water possesses an extraordinary cohesive power, sufficient, indeed, to permit of its being heated to a temperature of 275° Fahr. without boiling. The adhesion of water thus prepared to the surface of a glass tube was shown experimentally, the force being sufficient to sustain a column of water of considerable height. The contractile force of a soap-bubble was referred to; and the lecturer passed on to the exhibition of the phenomena resulting from the shock of two opposing liquid veins. In this case, though the forces are in opposite directions, motion is not annihilated; but the liquid, as first shown by Savart, spreads out so as to form a thin transparent film, the plane of which is at right angles to the direction of the jets. By varying the pressure on one side or the other, or by making the jets of different diameters, the plane film could be converted into a curved one, and sometimes actually caused to close, so as to form a pellucid sack. A cistern, situated at the top of the house, and communicating by pipes with the lecture table, placed a considerable pressure at the disposal of the lecturer, and enabled him to exhibit in a striking manner the various phenomena described by Savart in his researches on the motion of liquids. A vein was caused to fall vertically upon a brass disc upwards of three inches in diameter: the liquid spread laterally on all sides, and formed an umbrella-shaped pellicle of great size and beauty. With a disc of an inch in diameter, a pellicle of at least equal magnitude was formed. When a candle was placed underneath the curved sheet of water a singular effect was produced. The film above the candle was instantly dissipated; and on moving the candle, its motion was followed by a corresponding change of the aqueous surface. On turning a suitable cock so as to lessen the pressure, the curvature of the film became increased, until finally the molecular action of the water caused it to form a curve returning upon itself, and exhibiting the appearance of a large flask. When the film completely embraced the vertical stem which supported the brass disc, a change in the form of the liquid flask was observed, the

latter became elongated, and was sometimes divided into two portions, one of which glided down the vertical stem and was broken at its base. When the jet was projected vertically upwards, large sheets were also obtained. The jet was also suffered to fall into small hollow cones of various apertures, and the shape of the liquid sheet received thereby some beautiful modifications. The inclosed sides of the hollow cone gave the liquid an ascending motion which, combined with the action of gravity, caused the film to bend and constitute a vase-shaped surface of great beauty. The lecturer next referred to the constitution of a liquid vein; he had pointed out, some years ago, a simple mode of observing this constitution by means of the electric spark; this method corroborated the result before arrived at by Savart, that the lower portion of a liquid vein owes its turbidity to the fact of the mass being there reduced to drops, although the quickness with which they succeed each other gives the eye the impression of continuity. Savart's last experiments on this subject were repeated; a tube about five feet long and two inches wide had a perforated brass disc fixed at its lower extremity; the tube was filled with water, which, after it had become motionless, was permitted to issue from an orifice pierced in the centre of the disc. As the liquid escaped it gave birth to a succession of musical notes of sufficient intensity to be distinctly heard throughout the theatre. That these notes were not due to the motion imparted to the air by the descending drops of the liquid vein was proved, first, by intercepting the vein in its continuous portion, and secondly, by permitting it to discharge itself into a vessel containing water, the orifice being caused to dip beneath the surface of the latter. In this case the mass of liquid was continuous, but the notes were nevertheless produced; thus showing that the vibrations which produce them must take place in the glass cylinder itself, and corroborating the conclusions arrived at by Savart from his earliest experiments on this subject. The pitch of the note depends upon the height of the liquid column which produces it; and by attaching a tube of an inch in diameter, furnished with a perforated bottom, to a cylindrical vessel about eighteen inches wide, and filling the whole with water, a note of long duration and of sensibly constant pitch was obtained.

The lecturer concluded with an experimental illustration of the total reflection of light at the common surface of two media of different refractive indices. The tube communicating with the reservoir before referred to was fitted into the top of a small box, into one of the sides of which was fitted a glass tube three quarters of an inch wide and five inches long. The side of the box opposite to that through which the glass tube was introduced was of glass. Behind the box was placed a camera, by means of which the electric light could be condensed and caused to pass, first through the glass back of the box, and then through the tube in front, so as to form a white disc upon a screen held in the direct path of the light. When, however, the cock was turned so as to permit water to spout from the tube, the light, on reaching the limiting surface of air and water, was totally reflected, and seemed to be washed downward by the descending liquid, the latter being thereby caused to present a beautiful illuminated appearance.

## FORSTER'S IMPROVED WATER FILTER.

A paper descriptive of Forster's filter was read, by Mr. Archibald Slate, at the General Meeting of the Institution of Mechanical Engineers, Birmingham, in May last.

The subject of water filters, said Mr. Slate, is one of considerable importance, having received much attention, and it has been the subject of many ingenious inventions. It will be unnecessary to urge the necessity and advantage of filtering water both for domestic and manufacturing purposes, and the desirability of obtaining an efficient, convenient, and economical means of removing from the water all mechanical impurities.

The filter that forms the subject of the present paper,—the original invention of Mr. James Forster, of Liverpool,—consists of a small apparatus attached to the cock from which the supply of water is drawn, the water being passed through the filter at the time of discharge.

The construction of the filter is shown in the accompanying engraving; the filtering material consists of a hollow stone cylinder, A A, about 4 inches diameter, 7 inches long, and ¾ inch thick, with a rounded close end below, and cemented at top into a groove in the cast-iron cap, B B. This cap has a brass delivery-pipe, C, communicating with the interior of the stone cylinder, and bent to prevent the escape of water when not required.

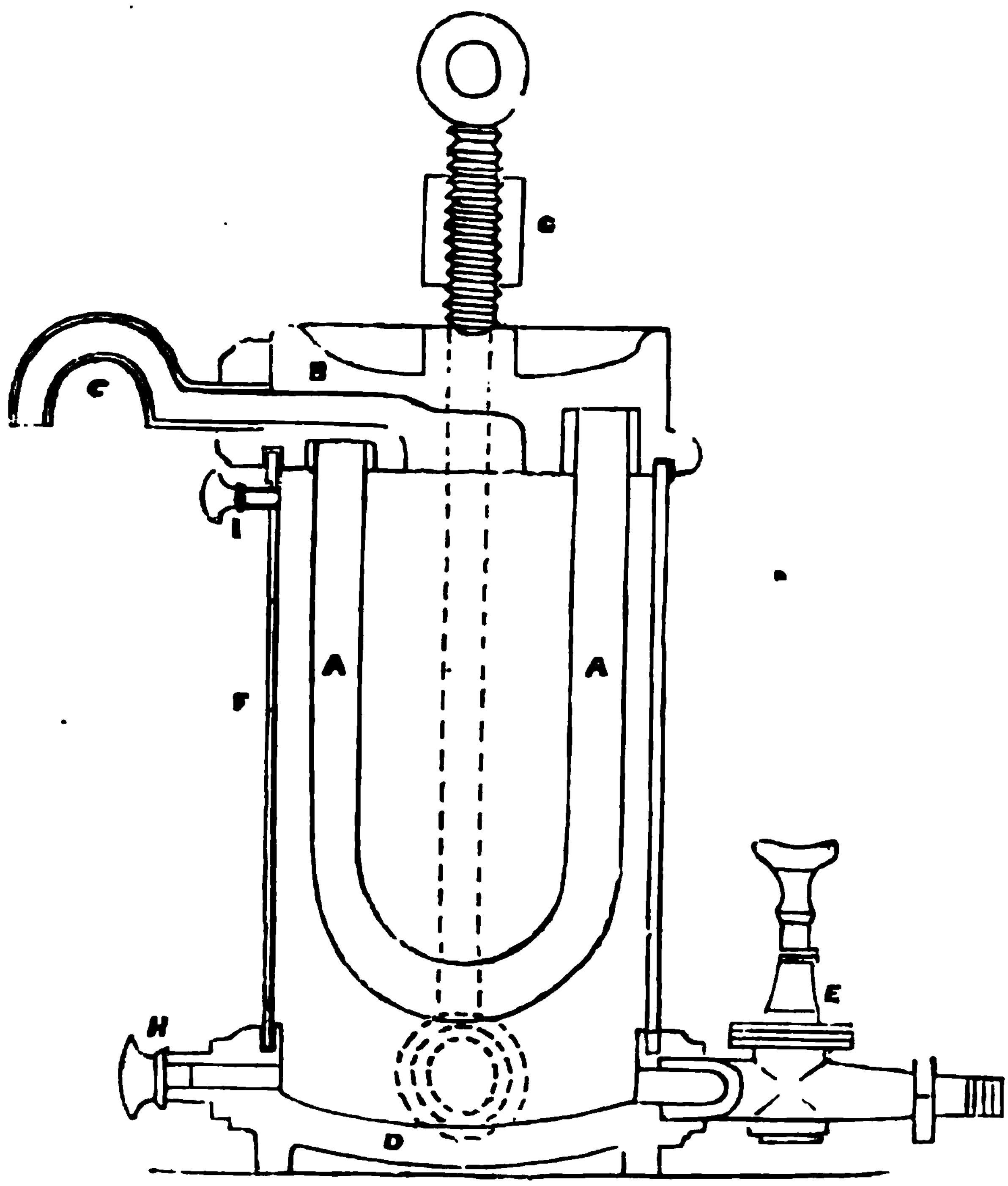
D D is a cast-iron base into which the supply pipe and cock, E, is fixed; and a cylindrical tin casing, F F, is fixed in a groove in the cap and base, and is secured

by the frame and screw, G G, connected by two side pins to the base, and screwed down upon the centre of the cap, making the joints water-tight.

When the supply-cock, E, is opened, the water fills the outer casing, filters through the stone cylinder, and is discharged by the delivery pipe, C; the stone being a fine-grained pure sandstone, suitable for the purpose, retains all the impurities of the water upon the outer surface, and delivers the water in a pure, clear stream. The action of the filter is an imitation of a pure spring issuing from a sandstone rock, which may be considered as a natural pressure-filter.

There is an important advantage in filtering water immediately before using it, as its freshness is then insured; but this is liable to be impaired, if the water is filtered previously, and stored up until drawn off for use. With the use of such a filter, whatever may be the state of the water in the mains, from the opening of them for repairs, and other causes, a supply of pure water is always obtained for use.

The practical value of a filter is greatly influenced by the facility with which it can be kept clean; and in the present filter this object has been more particularly aimed at; the process of cleaning it is very simple, and can be effected by any person in a few minutes. The filter may work for some months before requiring to be cleaned; the




general plan is to clean the filter when the water is found not to flow freely from it.

The top screw, G, is then loosened and the frame turned on one side, which allows the iron cap with the stone cylinder attached to be lifted out of the casing, and the outer surface of the stone is then scrubbed with a piece of sandstone, and well washed, which removes all the deposit, and leaves it as clean and ready for use as at first. Previous to loosening the top screw, the small screw-plug, H, is opened at the bottom to let the water out of the casing, and the screw, I, is opened to let in air.

The deposit from impurities from the water is found to take place entirely on the outer surface of the stone, and penetrates only a very slight depth into the stone, so that it can be readily and completely cleaned by scrubbing the surface with sandstone.

When the water to be filtered is very dirty, the stone cylinder is encased in a

flannel bag, which prevents the larger portion of the deposit from lodging on the stone, and saves trouble in cleaning, as well as enabling the filter to continue in action longer. In cases where the water is somewhat infected, by being exposed to any decaying organic matter, some animal charcoal is placed in a bag, or a flat perforated box, in the bottom of the filter, so that the water is purified by passing through the charcoal before entering the filtering stone.

These filters have been in use for the last three years, and have proved quite satisfactory under all circumstances; several of them were in constant use in the Exhibition of 1851, and a number have been in use in Liverpool for some months. They are applicable for general domestic use, as the pressure required for filtering is so small, that any house having water laid on from water-works, or even a rain-water cistern at a moderate height, would have sufficient pressure for working this filter; it is working at Lambeth, with a pressure of only 9 feet, and at the Board of Health, under about 15 feet head. The small size of the filter, and its convenience of application, make it suitable for any situation.

It appears also from experiment, that in the cases where the water is soft, and has become impregnated with carbonate of lead, from contact with leaden pipes or cisterns, this is entirely separated by the stone filter —an important sanitary advantage.

After the reading of the paper, the Chairman (Mr. Slate) remarked, that he had brought the present plan before the meeting, in consequence of the subject of water-filters having been referred to in the discussion at the last meeting, and this was brought forward as a simple construction of filter which could be readily and frequently cleaned, so as to preserve it always in good action.

Mr. Forster exhibited a specimen of the filter, and showed the process of cleaning it when required.

Mr. Bird inquired how long the filter was found to work before cleaning? how many gallons of water could be passed through it before the stone required taking out and cleaning?

Mr. Forster said, that he had not had an opportunity of ascertaining the quantity of water, but could state that one of the filters fixed in Liverpool had been supplying all the water for a large household during three months before requiring cleaning. The time of cleaning would of course depend on the quality of the water, but as far as his experience went, the filters for domestic purposes would not require cleaning oftener than every two or three months with the ordinary quality of water.

Mr. Bird observed, there was no difficulty in obtaining a good filtering medium, but the difficulty was to get a filter that would keep at work without requiring renewing or cleansing so frequently as to limit greatly its practical application; he had tried a great many experiments on the subject, with a variety of materials, and found this was the principal difficulty. He had tried sandstone as a filter, in a disc of 9 inches diameter and ½ inch thick, but found it was nearly stopped by the accumulation of deposit in about 12 hours, when about 400 gallons had passed through; and unless the sandstone were much purer and less calcareous than could be procured in this district, he did not understand how it could be kept at work any length of time. He thought the most important practical test of a filter was the quantity of water that it would filter before requiring cleaning or renewing, as well as the convenience of effecting the cleaning.

Mr. Addenbrooke thought a filter that did become choked would be preferable, as that was a proof it was doing its duty.

Mr. Forster said he had endeavoured to get a measure of the quantity passed through, but had not been able to do so, from the long time that the filter kept at work before requiring cleaning.

The Chairman observed that it appeared to him, the more important point was to have a filter that could be very readily taken to pieces, cleaned, and put to work again, rather than one which would continue a long time before requiring to be cleaned.

Mr. Clift thought that perhaps the oftener a filter required cleaning the better, as the object was to obtain fresh pure water.

The Chairman said that the object in that filter had been to facilitate and encourage the frequent cleaning of the filter; it was better to get it cleaned out too frequently, so as to ensure its being kept in good condition, than to risk the accumulation of any animal or vegetable matter in the filter from any accidental neglect. The trouble and expense generally attending the cleaning or renewal of filters had led to the custom of requiring them to work for a long time before cleaning; but he thought that with a filter that could be taken to pieces and cleaned by any person in a few minutes, such as the present one, it might have even a weekly cleaning as a regular rule.

Mr. Jobson inquired what was the pressure of water where the filters had been tried in Liverpool?

Mr. Forster replied that the pressure was 170 feet head, but a very moderate head, about 15 feet, or only the height of one story, was found to give sufficient pressure for an ordinary supply of water in a house.

The Chairman said he hoped the exact facts would be ascertained, for another occasion, about the quantity of water passed through the filter before cleaning.

## ROYAL SOCIETY OF ARTS, MANUFACTURES, AND COMMERCE;

### ITS CENTENARY CELEBRATION, AND EDUCATIONAL EXHIBITION.

The centenary dinner of the above Society was given at the Crystal Palace, on Monday last. In the absence of the Duke of Newcastle, who had been announced to preside, the chair was most ably occupied by Earl Granville. The number of gentlemen who were present amounted to nearly eight hundred, most of whom were publicly and eminently associated with those pursuits, to foster which the Society was established. The dinner, which was served in the basement story of the Palace, at five o'clock, was provided in a manner which is rarely if ever excelled at such entertainments, and the whole proceedings were conducted with admirable skill and succinctness. After the usual Royal toasts were drunk, there followed "Success to the Crystal Palace, and the Healths of the Directors of the Crystal Palace Company," (or, as the worthy toastmaster put it "Success to the Crystyal Palace, and the Healths of the Crystyal Palace Company"). In responding to this, Mr. Laing, the Chairman of the Company, whose name was associated with the toast, among other things said, "I am not disposed to underrate the educational advancement to be made in such scenes, where we are surrounded by the sight of all the most charming in nature and the most excelling in art. For the general diffusion of education, however, among the masses of the people, we must trust to the operation of associations such as this, and to men who come up like those whom I see around me representing them. If we were to attempt to take into our hands the ferula of the schoolmaster, and say to the million what we think they should particularly attend to, I believe that we would most assuredly not advance, but render ourselves ridiculous. If, on the other hand, gentlemen like those whom I see around me will take the matter in hand and organize it, then a great deal of good may result to education. I do, therefore, trust that our connexion with the Society of Arts—from whose loins I may say we have sprung—may be the means of promoting co-operation between us in our endeavours for the same object. I can now only return you on my own part, and on that of the Crystal Palace Company, our most sincere thanks for the honour you have done us, and I hope that the Crystal Palace—sprung from the Society of Arts—may turn out to be an institution of which the parent society may never have reason to be ashamed."

The Chairman then proposed the "Society for the Encouragement of Arts, Manufactures, and Commerce;" and in doing so delivered an able speech. "The only thing," said he, "which I have to consider in proposing, and you in accepting, the toast is, whether the objects of this Society are desirable in themselves, and whether the attempts to carry out those objects have been successful or not. With regard to the objects, I really should have imagined that there could have been no doubt upon the subject. But it having happened that within a short time two of the most intellectual and highly-cultivated members of the Legislature—one in each house—have thrown some disparagement upon the necessity of elementary education and the use of trying to instil arts and sciences among the masses of the people, I must appeal to you for a few moments on this subject. For my own part, I cannot help thinking that it is a proof of the overwhelming confidence which such highly-cultivated minds feel in themselves that they indulge in what appears to me such a perfect fallacy. I maintain that here is represented pretty well the sense of this country. Among us there are some of the most distinguished representatives of the intelligence of some of the most highly-cultivated countries in the world. If any one of the seven hundred and fifty gentlemen who are here present is inclined to take the line of argument which I have just distinguished, I will undertake to argue it with him, and I would do so not from any confidence in my own abilities, but because I believe that, however inferior the understanding of one man may be to another's, if they take up an argument upon a proposition of Euclid, the one who argues against that proposition in the long run must get the worst of it. My challenge does not seem to be accepted, I therefore presume you agree with me that the object of this Society is a desirable one," &c. &c.

Other toasts followed, and the company dispersed soon after 8 o'clock.

On Tuesday evening the Educational Exhibition was opened with a *conversazione* at St. Martin's-hall, Long-acre, at which His Royal Highness Prince Albert, the President of the Society, was present. A highly influential company, comprising many of the most eminent persons con-

nected with education in this and other countries, assembled, and expressed themselves greatly gratified with the valuable and instructive collection of educational apparatus exhibited. In alluding to the exhibition, Earl Granville, on the preceding evening, said, "I cannot help thinking it will have the most beneficial effect, not only as giving information respecting education in this and in other countries, but as bringing the attention of the public still more to the subject. I am one of those who think that immense progress has been made both in elementary instruction and in the necessity which all classes of English society feel for a greater admixture of instruction in manufactures and science than has hitherto been given. I believe by the efforts of the State, by the efforts of public bodies—both of laymen and of religious bodies—and, I may add, by the efforts of individuals whom I could name—and I should like to particularize them if they were not present—immense assistance has been given to the cause of education in this country. The mode of imparting education has been immensely forwarded and improved. A race of teachers utterly unknown a few years ago has been created. Without referring more in detail to anything which has lately been done by the Government, I believe that the regulations which have been adopted within the last year will, within a very few years, show their result in a very largely increased measure of instruction, both in science and in art, being given in the elementary schools of this country. But when I have said this, so far from being proud of the progress we have made, I feel that there is a lamentable deficiency when we compare the state of education with the power and resources of this great nation. Plans have been suggested—many of which, I believe, would work very well if all persons would combine in carrying them out—but it is useless either for Government or any other body of men to force down conscientious objections to any particular plan when those conscientious objections are founded on political and religious feelings. I think we must for the moment, and only for the moment, be satisfied with pushing education through every possible avenue that we can find for it. Now, I think that the Society of Arts, in their forthcoming exhibition, are likely to be most useful for this purpose. This Society numbers among its members some of the most distinguished men in every line of life that we have in this country, and yet I do not value the Society so highly for having pushed any particular branch of science, as on account of its universality and its versatility in shaping itself to the wants and feelings of the present age. As a body, they are a rough-and-ready, bustling community; they are constantly pushing themselves into corners where I really believe they have no business to go at all, and where, if the Government attempted to follow, nothing but the most irretrievable confusion and ruin would be produced."

## ON THE CARTESIAN BAROMETER.

BY W. ROXBURGH, M.D., M.R.I.*

Soon after the discovery of the variations in height of the barometer, Descartes proposed the following mode of rendering them more conspicuous, almost as much so as they are in one filled with water alone. He suggested that two tubes should be joined to the opposite ends of a short wide cylinder, so as to form one straight tube, which, being closed at one end, was to be filled with pure water and mercury in such proportions as to allow of the two fluids at all pressures meeting in the cylinder. In this, the Cartesian barometer, the pressure of the atmosphere is balanced by the water and mercury conjointly; but the variations of pressure are indicated chiefly by movements of the water, as the level of the mercury varies little in consequence of the large area of the cylinder. The movements of the water and mercury are to each other inversely as the areas of the tube and cylinder. The scale is that of the common barometer enlarged, as in the wheel barometer; when, therefore, the movements are said to amount to so many hundredths of an inch, it is to be understood as meaning that they are equal in value to that height of mercury. The scale can be enlarged so as to render movements of $\frac{1}{400}$th of an inch visible to the unassisted eye.

The only records of this instrument that I have seen state that the air contained in the water is given off when the pressure is removed, and so renders its indications incorrect; also that this imperfection is irremediable. This depression, amounting in one year, in my first experiment, to only ·02 of an inch, has led me to suppose that the depression which caused the plan to be set aside was owing to the force of vapour, which was not so well understood at that time as at present; and as many variations of pressure are easily seen in this barometer which would escape notice in the mercurial one, and if not attended to, give rise to error, I think it will prove a valuable addition to

* The above remarks have been supplied to the Royal Institution in relation to a barometer constructed by the author, and exhibited recently at that Institution.

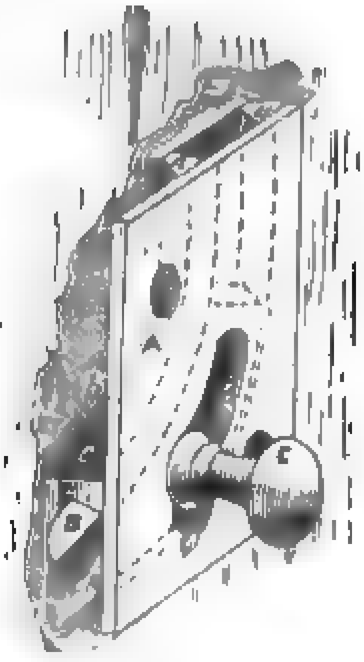
a standard barometer, though never a substitute for one.

In hopes of getting rid of the air, and of lessening the correction required for the force of vapour, I tried several fluids in place of pure water. Among these was oil of turpentine; this caused a rapid evolution of gas and blackening of the mercury, and depressing the column several inches in a few minutes. A saturated solution of muriate of soda seemed at first more successful, but in a short time the column became depressed, and this depression continuing to increase at a regular rate, the tube was emptied, when it was found that the salt having crystallized between the mercury and the glass, had so allowed the air to enter.

A solution of muriate of lime, not being crystallizable, was next tried; and this seems to stand best, as yet having sunk in 2½ years only ·03 of an inch, the greater part of this depression having occurred in the first few months, giving rise to the surmise that the air which has caused it was left in at the time of filling, and has not crept in since. The addition of the salt to the water, besides removing to a great extent the air, has the effect of diminishing the correction required for the force of vapour; the last-named solution has its boiling point at 234° Fahr., and, as has been shown by experiments, the tension of vapour from water and watery solutions of salts is the same at an equal number of degrees below their boiling points, the correction to be applied is lessened to that of pure water, 22° lower than the observed temperature. This correction, which is to be added, and that for the expansion of the fluids, which is to be subtracted, thus nearly neutralizing each other at low temperatures, I have applied by means of a moveable scale, in the same way as is used in the sympiesometer. Among the slighter variations shown by this barometer, may be mentioned the oscillations during a gale of wind; these are quite as conspicuous in this barometer as they were observed by Professor Daniell in the water barometer, amounting frequently to 0·03, and once to 0·4 of an inch; they vary in duration from 5 to 7 seconds; they begin with a short, quick rise, followed by a slower and much greater descent, and then a return to the point of rest, which is much nearer the top than the bottom of the oscillation. Previously to a gale of wind, the column descends by jerks and with irregular rapidity; but on one occasion, on which no wind followed for two days, the column fell without the slightest jerk more than half an inch; there was, however, a heavy and long-continued fall of rain. During heavy and sudden showers the column rises, and falls again on the cessation of the shower; on one occasion the rise was ·02 of an inch. In a room with a fire, with a door and window shut, the column is lower than when the window is open; the difference is usually ·005, but with a good fire ·01 of an inch. The last two causes are very likely to give rise to error, and the better the barometer the greater will be the error.

## WINDOW-SASH FASTENERS AND STOPPERS.

The annexed engraving is a view of an improvement in window-sash stoppers and fasteners, for which a patent was granted to E. G. Conelly, of Indianapolis, Indiana, on the 21st of last February (1854.) The fig. represents a perspective view showing the application of the fastener to a window-sill.



A is a small metal plate with curved ridges, *a a*, on it, forming a groove or channel between for the sliding catch, B. The catch is of the form of a segment of a circle; *b b* are central parts of the ridges, *a a*, which are higher than at the other parts, for the plate, C, to be laid upon the ridges and lock over the slide, B. This plate, C, being laid over the slide, B, the plate, A, is fastened with screws into the sill of the window-sash—a recess being cut out for its reception, so as to set in the sill like a box; *d* is an oblong curved slot in the plate to allow the shank, *e*, of the slide to project through, and to move it back when required, but not forward, as the gravity of the slide makes it catch of itself, and is self-acting, thus having the very same principle of action as a spring, which is used on many

window-catches, without any of the disadvantages of a spring. The manner of its thus acting is shown in the figure. Of course there is a recess made in the frame of the window to receive the slide, B. It is truly, therefore, a gravitating sash-bolt and lock. Every person, we presume, from this description, and the engraving, will understand the construction and operation of this very neat, useful, and excellent sash-lock. —*Scientific American.*

## SUCCESSFUL TRIALS OF WIMSHURST'S ROTARY ENGINE.

At page 285, vol. 55, we gave the results of certain experiments that had been made with Mr. Wimshurst's engine, which was employed *first* to overcome the friction of a break-wheel, and *second*, to raise coals from the Great Britain pit. Subsequent trials, we are informed, have been made, in which the same engine has been tested against a pair of Messrs. Boulton and Watt's engines, driving a screw-propeller with results which merit attention, since they have a very important bearing upon steam navigation, promising an increase of power with a less consumption of fuel, and the occupation of much less space than that ordinarily required for the common reciprocating engine.

In the trials referred to, the cylinder was 60 inches in diameter, the piston 40 inches long, having an area equal to 480 square inches; the pressure of steam in the boiler was 12 lbs. on the square inch, the engine working with condensation, and the vessel, which was of about 300 tons burden, was driven by a screw propeller of 10 feet diameter and 20 feet pitch. The speed attained was from 13¾ to 14 miles per hour, the propeller making 65 revolutions a minute. After several trials, Messrs. Boulton and Watt took out the rotary, and fitted in its place a pair of 30 horse-power direct action engines; and on a trial of speed with the same propeller as before, the vessel made, we are told, only 8 miles an hour. Again, when the vessel was lashed to the wharf, the number of revolutions made by the propeller was, with the rotary engine, 45, and with the reciprocating but 28. We need not here enter into the causes of the discrepancy of the results obtained with the two engines; since, beside the self-evident advantages which rotary engines afford in the method of employing the steam that drives them, our readers are able to judge of the peculiar merit of Mr. Wimshurst's arrangement from the descriptions we have already given of it. We may, however, just mention that the internal construction of his engine is such that the weight of the pistons, interior cylinder, &c., instead of augmenting the friction, as might be expected, is in reality balanced by the upward pressure of the steam, in which they may be considered to continually float, so that the friction is indeed of a very small amount, and almost the least possible steam pressure is sufficient to work the engine freely.

We certainly think that the public is indebted to Mr. Wimshurst, who, it will be remembered, was the first constructor of screw-propeller steamers (the "Archimedes" and the "Novelty"), for another considerable improvement; and there can exist but little doubt concerning the benefit that will be universally experienced by the production of a really serviceable rotary engine. We hope that gentleman will meet with the success that his invention deserves.

## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

*To the Editor of the Mechanics' Magazine.*

Sir,—A great deal of the attention of inventors and mechanical men is directed to the invention of new propellers for ships, and to the improvement of those already in use. Some attempts thus directed, with the expositions of their originators, have come under my notice,—most of them ingenious, certainly, but nearly all betraying, in the inventors, a want of a thorough appreciation of the whole of the difficulties to be dealt with in the production of an effective propeller. Believing that many read your Magazine who have not set themselves to study systematic treatises on this subject, I think it will not be impertinent to request your permission to start it in your Journal by a few observations on what is of great importance in all machines, and especially so in that spoken of, viz., the ratio which the useful effect bears to the whole work expended,—directing my remarks to marine propellers generally.

I will first take the case when the propelling area moves perpendicular to itself, and in a direction directly opposite to that of the course of the vessel which it propels, of which the paddle and the oar are approximate examples. Let us suppose that $v$ is the ship's velocity; $v^1$ the velocity which the propeller has in relation to the fluid; R the resistance on the bows, and therefore the resistance or pressure on the propeller. It is pretty plain that the work which would be needful to keep the vessel moving with a velocity, $v$, if the power had a fixed obstacle to act against, would be only

$$R\,v,$$

whereas in the case before us the work expended to produce this effect is

$$R(v + v^1),$$

which exceeds the former by

$$R v^1,$$

and $v^1$ must generally bear a considerable proportion to $v$, as the area of the propeller cannot generally be made sufficiently large to reduce it to anything like insignificance. The disadvantage of small propellers driven at high velocities is here very evident, as $v^1$ must be increased as the area is diminished in order to obtain the required reaction, R. This, too, shows the advantage at which a horse walking by the side of a canal will tow a barge; having to perform only the work, R $v$, though an engine with any ordinary kind of propeller would have to perform an amount represented by $R(v+v^1)$.

Another case which I may consider, is that of a plane area inclined to the direction of the vessel's motion, but moving in a direction perpendicular to that of the motion. As an instance of this, we may take any elementary portion of the blade of a screw. Let R be the resistance on the propeller as before, and $v$ the velocity of the vessel; $\theta$ the angle between the plane of the propeller and the direction of the vessel's motion, $v$ the velocity of propeller. Then it will be seen that the resolved part of the resistance on the propeller in the direction of the ship's course must be equal to the resistance on the bows, therefore this last resistance $= R \sin. \theta$.

So that the work done on propeller

$$= R\, v \cos. \theta.$$

Here the loss will be represented by

$$R \left\{ v \cos. \theta - v \sin. \theta. \right\}$$

To compare this with the case of the direct propeller, let us suppose that their areas are the same, and the normal velocities in relation to the water the same; we shall thus keep clear of much of the doubtfulness of the theory of resistance, as we shall only assume that the same area moved through a fluid at different angles, but with the same *normal* velocity will always meet with the same *normal* resistance. Hence the equation

$$v^1 = v \cos. \theta - v \sin. \theta,$$

and

$$R v^1 = R(v \cos. \theta - v. \sin. \theta),$$

or the loss of work is the same in both cases, with this disadvantage in the case of the oblique propeller, that the useful work performed is less than in the first case, inasmuch as

$R\, v \sin. \theta$, is less than R $v$.

These little considerations seem to me important, because they appear to be independent of the ambiguity and uncertainty in which the subject of resistances is involved. This has induced the present communication.

I am, Sir, yours, &c.,

A MECHANIC.

## HANCOCK'S CAOUTCHOUC PATENT.—LAW CASE.

*In the Exchequer at Westminster.*

HANCOCK *v.* ROSS.

*Tried before the Lord Chief Baron on the 26th, 27th, and 28th June, 1854.*

THIS was an action brought by Mr. Thomas Hancock against the defendant for the infringement of the plaintiff's patent of 21st November, 1843, for improvements in the preparation or manufacture of caoutchouc, in combination with other substances.

The invention described in the specification consists of three parts;—1st. A combination of India-rubber and silicate of magnesia (French chalk). 2nd. A combination of India-rubber and asphalte; and 3rd. A combination of India-rubber and sulphur, and the application of heat at a high temperature, producing the effect now well known as vulcanization.

The defences were—1st. That the patent was sold on the ground that a part of the invention was not new, and the plaintiff not the true and first inventor; and 2nd. That the defendant had not infringed.

The alleged infringement was the sale of the well-known American overshoes by the defendant.

Sir Frederick Thesiger, Mr. Serjeant Channel, Mr. Webster, and Mr. Karslake, appeared for the plaintiff, and gave general evidence respecting the novelty of the plaintiff's invention at the date of the patent; and the plaintiff himself being examined, stated that he had himself invented the combination of India-rubber and sulphur at a high temperature, but he admitted that he had not in his experiments which led to the invention, tried sulphur, until after he had seen some specimens of American rubber manufactured in America by Mr. Goodyear, and by his agent shown to Macintosh and Co., (of which firm the defendant was a partner), for the purpose of inducing them to purchase the invention.

The plaintiff's chemists stated that the over-shoes sold by the defendant were composed of India-rubber, sulphur, and oxide of lead; but they attributed the vulcanization entirely to the agency of the sulphur, and therefore it was contended the shoes

were an infringement of the plaintiff's patent.

The Attorney-General, Mr. Atherton, and Mr. Hindmarch, appeared for the defendant, and called Mr. Goodyear and other witnesses, who proved that the process of curing India-rubber for the purpose of rendering it permanently elastic, was invented by Mr. Goodyear in America in 1842, and that the elements used in forming the compound, at a high temperature, were India-rubber, sulphur, and white lead, the latter of which was essential to make a good article, the triple compound, it was said, being essentially different from that described in the plaintiff's specification.

The specification of Fanshaw's patent, of December 16, 1841, was given in evidence, and it was contended that it described a compound of India-rubber and asphalte, and that therefore the second part cf the plaintiff's invention was not new.

The defendant also gave in evidence the description of the plaintiff's invention deposited by him with the Solicitor General when he applied for his patent, contending, that although it did not mention the application of heat in any way, and although sulphur was mentioned, it was in such a manner as showed that the plaintiff intended only the mechanical mixture of it with the India-rubber.

It was also proved, that Mr. Goodyear's agent (Mr. Moulton) exhibited samples of vulcanized India-rubber to the plaintiff's partners in 1842 and 1843, when there was a negociation between them for the sale of Goodyear's invention to the firm, that Messrs. Macintosh afterwards ordered some goods, which were sent to them from America, by Mr. Moulton (through Messrs. Wrench, of Thames-street), and that they received those goods some time before the enrolment of the plaintiff's specification. And it was suggested on the part of the defendant, that the plaintiff had unfairly obtained a knowledge of the invention after the date of his patent, and that it was not therefore comprised in the patent.

The Lord Chief Baron summed up, recapitulating all the principal parts of the evidence, and leaving the three questions of invention, novelty, and infringement to the jury.

The jury then retired, and after being locked up several hours, they came into court, stating that they had not agreed, and that there was not any prospect of an agreement.

The Lord Chief Baron then discharged the jury.

Attorneys for the plaintiff, Karslake and Co., for the defendant, Sewell and Co.

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## TRUMAN'S PATENT ARTIFICIAL TEETH.—LAW CASE.

*In the Queen's Bench.*

TRUMAN *v.* BELLIS.

*Tried before Lord Chief Justice Campbell, 27th and 28th June,* 1854.

In this case the plaintiff had brought his action for the infringement of a patent granted to him 15th August, 1848, for his invention, entitled "An improved method or methods of constructing and fixing artificial teeth and gums, and of supplying deficiencies in the mouth."

The Attorney - General, Mr. Montagu Smith, and Mr. Hindmarch, appeared for the plaintiff, and Mr. Montagu Chambers, Mr. J. Brown, and Mr. Harcourt, for the defendant.

The plaintiff himself was the first witness, and he stated that, in working according to his invention, artificial teeth are fixed upon a skeleton frame by means of rivets or pins, in like manner as in fixing them upon frames or plates in ordinary artificial tooth-making, and that gutta percha is then placed underneath, so as to form the bearing or surface which is to rest upon the natural gums, the gutta percha being also pressed up over the sides or edges of the frames and round the bottoms of the teeth, to the same height as the natural gums before they were deprived of the natural teeth.

The plaintiff and many other witnesses gave evidence respecting the novelty and utility of the invention, and the sale by the defendant of a set of teeth substantially the same as the plaintiff's was proved.

The defendant called several witnesses to prove the application of gutta percha in various ways in the manufacture and repair of artificial teeth before the date of the plaintiff's patent; and amongst others, a dentist, who proved that some time before the date of the patent he repaired an old set of artificial teeth for a lady, and that the gums having fallen, he put a layer of gutta percha under the plate or frame, so as to rest upon the natural gums, and then pressed the gutta percha over the sides or edges of the plate and round the bottoms of the artificial teeth.

Lord Campbell said this seemed to be exactly what the plaintiff described and claimed as his invention, and that the circumstance that the frame operated upon was an old one, could not make any difference. His Lordship then intimated to the Attorney-General that after this evidence the patent could not be supported, and directed the jury to give a verdict for the defendant.

## USEFUL RECIPES.

*To the Editor of the Mechanics' Magazine.*

SIR, — The following recipes may be worthy of a place in your valuable paper:

I. *For Cramp.*—Cut old or any cheap corks into lengths about three-eighths of an inch, string eighteen or twenty of these pieces on a tape, making a knot between each to keep them separate, and tie the tape tight above the knee when the pain comes on. It gives immediate relief. If tied on before the patient lies down, the cramp does not attack the person.

I have used a cork garter at night for nine years, and never found it fail.

II. *For Gravel.*—Put three ounces of rosin into a wine-bottle, fill up with common gin, and take a wineglass full of the solution every day. I have given this to several village patients with effect. I heard it from a cottager.

III. *To Kill Bugs.*—Light some charcoal in the room, turn up the bedding and other articles, and shut the door and windows. The only objection is, that the paint turns yellow.

IV. *To Kill Wasps.*—Pour a little oil of tar into the hole, and close it tight.

I am, Sir, yours, &c.,
WILSE BROWN.

Eggleston, Barnard Castle,
June 30, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

PATTERSON, JOHN, of Beverley, York, engineer. *Improvements in land-rollers or clod-crushers.* Patent dated November 30, 1853. (No. 2788.)

This invention consists in the employment of cranked axles, or an axle composed of a series of cams or eccentrics bolted together, and set opposite each other upon the shaft, or at any angle found most desirable. Around each of these cranks or eccentrics a disc is caused to revolve, and the aggregate of these discs forms the roller or crusher.

*** The filing of the above specification has been delayed by opposition at the Great Seal, as previously announced, vol. lx., page 571.

SMITH, SAMUEL, of Horton Dye-works, near Bradford, York. *Improvements in preparing rovings and yarns of wool.* Patent dated December 16, 1853. (No. 2930.)

This invention consists in winding rovings or yarns of wool when wet on to a hollow cylinder perforated with numerous holes, and then causing steam to pass through the rovings and yarns.

GOODYEAR, CHARLES, of St. John's-wood, Middlesex. *Improvements in the treatment and manufacture of India-rubber.* (Partly a communication.) Patent dated December 16, 1853. (No. 2933.)

This invention has for its object means of working up and re-using vulcanized or changed India-rubber, and consists in masticating it with natural or unvulcanized India-rubber.

KNOX, ANDREW LAWSON, of Glasgow, manufacturer. *Improvements in ornamenting certain descriptions of textile fabrics.* Patent dated December 16, 1853. (No. 2934.)

This invention relates to fabrics which are raised upon one surface by carding or other similar treatment, and also to fabrics which are woven with loops or other raised loose threads on one side, as terries, for instance; and consists in producing patterns upon the other side of such fabrics by printing, staining, embossing, or other such process.

THOMSON, HENRY, of Clitheroe, Lancaster, calico-printer. *Improvements in machinery or apparatus for stretching textile fabrics as they are wound into laps or rolls after the processes of bleaching and dyeing, or operations connected therewith.* Patent dated December 16, 1853. (No. 2935.)

*Claims.*—1. The use of a platform and a roller, whereby an attendant may open out the goods as they pass to the machine. 2. The use of rollers placed at an angle to each other, so as to distend the goods towards their selvages before their arrival at the lap-roller.

WAITHMAN, ROBERT WILLIAM, of Bentham-house, York, esquire. *Improvements in belts or bands for driving machinery for use in mines, and for other purposes.* Patent dated December 16, 1853. (No. 2936.)

This invention consists in employing tubes for driving machinery, and in coating or cementing these tubes or other belts or bands with compositions, the principal ingredients of which are as follows: of the first, inspissated or partially inspissated tar; of the second, India-rubber and ground peat or bark; and of the third, gutta percha or caoutchouc dissolved in gas-tar.

BAILEY, JOSEPH SHARP, of Keighley, York. *Improvements in machinery for operating upon wool, alpaca, mohair, and other fibrous materials preparatory and prior to being spun.* Patent dated December 17, 1853. (No. 2937.)

In this invention the wool or other fibrous material is passed in by a feeding-head of any convenient construction, from which it is taken by the teeth of a roller, certain pieces of flexible material being then at or near the bottom of the teeth; the material is then carried by the motion of the roller

to the nearest point to the teeth of a second roller, by which it is taken off those of the first, the transfer being effected or facilitated by the outward movement of the flexible pieces referred to towards the points of the teeth.

HORTON, JOSHUA, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of certain kinds of metallic vessels.* Patent dated December 17, 1853. (No. 2938.)

*Claims.*—1. Welding the bottoms, or tops and bottoms, of iron vessels to the cylindrical parts of them by stamping. 2. Welding the bottoms, or tops and bottoms, of iron vessels to the cylindrical parts of them by passing the same between a pair of rolls, after the manner of rolling a tube or cylinder.

ANDERSON, GEORGE, of the Gas-works, Rotherhithe, Surrey, gas engineer. *Improvements in apparatus used when manufacturing gas, which apparatus or part of which is also applicable when transmitting gas from one place to another.* Patent dated December 17, 1853. (No. 2939.)

This invention consists in the employment, for the purpose of transferring gas, of a single chamber, with a piston moving therein at a comparatively high velocity, the chamber being double-acting, that is, having an inlet and outlet valve or set of valves at each end.

BEDELLS, CALEB, of Leicester. *Improvements in the manufacture of elastic fabrics.* Patent dated December 17, 1853. (No. 2940.)

In carrying out this invention, yarns or threads are wound side by side on a cylinder, and have a coating of cement applied to them. A thin sheet of vulcanized or changed India-rubber is then to be coated with India-rubber cement, and the surface of it brought in contact with the yarn or thread, so that the whole or a part of the yarn will be combined with it.

GREENWOOD, JOHN, of Arthur-street West, London-bridge. *Improvements in preventing draughts of air into rooms and places when the doors and windows are shut.* Patent dated December 17, 1853. (No. 2942.)

This invention consists in applying strips of vulcanised India-rubber on the parts against which a door or window closes, or on the doors or windows themselves.

JAMES, ISAAC, of Cheltenham, Gloucester, wheelwright. *Improvements in carts for distributing water or liquid manure.* Patent dated December 17, 1853. (No. 2943.)

The inventor claims a method of constructing a distributor with a lid, to enable it to be readily cleansed; and the combination of two or more sieves for straining the liquid as it passes into the body of the cart.

HOUGHTON, MATTHEW PARSONS, clerk, and ANDREW STEWART, mechanic, both of Hillmorton, Warwick. *An improved means of preventing accidents upon railways.* Patent dated December 17, 1853. (No. 2944.)

Between the rails, at suitable distances apart, the inventors place an apparatus that can be elevated when desired into a double incline plane, by levers placed on the side of the railroad, and thus be brought in contact with the passing train.

COCKINGS, JAMES SEPTIMUS, of Birmingham, Warwick. *Improvements in buttons and other dress-fastenings, part of which is also applicable for other purposes.* Patent dated December 17, 1853. (No. 2945.)

This consists in packing buttons partially with sawdust, and also in forming them hollow.

WHEWELL, ROBERT, of Little Bolton, Bolton-le-Moors, Lancaster, printer and bookbinder. *Improvements in machines used for cutting paper.* Patent dated December 18, 1853. (No. 2946.)

The inventor claims a mode of obtaining a compound lateral and vertical movement of the knife, and a method of actuating both the paper-holder and the knife by means of one handle, or by a motion obtained from the same shaft.

MILWARD, HENRY, of Redditch, Worcester, manufacturer. *New or improved machinery for manufacturing needles and fish-hooks.* (A communication.) Patent dated December 19, 1853. (No. 2947.)

The inventor describes and claims certain machinery for impressing and piercing needles, and for impressing, barbing, and kerbing fish-hooks.

TRIBELHORN, JOHN, of St Gall, manufacturer, and DR. POMPEIUS BOLLEY, of Aarau, professor of chemistry, both of Switzerland. *Improvements in the process of bleaching vegetable fibrous substances.* (A communication.) Patent dated December 19, 1853. (No. 2948.)

The patentees claim the use of oxide of tin in combination with caustic alkaline solutions for bleaching purposes.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in paddle-wheels for propelling vessels.* (A communication.) Patent dated December 19, 1853. (No. 2949.)

This invention consists in arranging the floats diagonally, so that they form a series of rhomb-shaped buckets all round the wheel

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in presses for expressing oil and other fluids from fruits, grains, or other substances.* (A communication.) Patent dated December 19, 1853. (No. 2951.)

The patentee arranges pressing plates so as to make them form a series of complete cases, in which the fruit, grain, or other substance to be operated upon is received and pressed, and from which it is discharged without removing the cases from the press, and without enveloping the substance in bags or mats. He also connects the pressing plates for the purpose of heating the substance by steam, while undergoing pressure.

Paterson, Adam, of Westminster, Middlesex. *An improved cooking apparatus.* Patent dated December 20, 1853. (No. 2954.)

This invention consists of a gas-cooking apparatus and boiler, which are so constructed, that the boiler can be heated by the products of combustion from fuel in a common grate or from gas-burners, separately or conjointly.

Campbell, James Hunter, of King's Arms-yard, Coleman-street, London, esquire, *An improvement in machinery for cutting corks.* Patent dated December 20, 1853. (No. 2955.)

This invention consists in the construction of a self-acting feeder, by which squares or pieces of cork to be afterwards cut into corks are supplied to the machine; and in its adaptation to machines of a similar description to the machine known as "Gilbee's Cork-cutting Machine."

Clark, Josiah Latimer, of Chester-villas, Canonbury-park South, Islington. *An improvement in insulating wire used for electric telegraphs, with a view to obviate the effects of return or inductive currents.* Patent dated December 20, 1853. (No. 2956.)

This invention consists in causing wires, which have been insulated by a coating or coatings of gutta percha or India-rubber, or compounds of these matters, to be further coated or inclosed in a cheaper insulating matter, resinous or bituminous matters being preferred for the purpose.

Durut, Henriette Elisa Farion de Gergy Veuve, of Paris, France. *Certain improvements in the manufacture of bread.* Patent dated December 20, 1853. (No. 2957.)

This invention consists in the use (for the purpose of making bread) of a liquid obtained by extracting the gluten from bran, by boiling it with water and then separating the bran from the liquid by pressure, instead of water.

Wagenmann, Paul, of Bonn, Rhenish Prussia. *Improvements in the manufacture of liquid hydro-carbons and paraffine.* Patent dated December 20, 1853. (No. 2958.)

In carrying out this invention, coals are broken into fragments of about the size of walnuts, and placed in a peculiar drying furnace, and are distilled in retorts, of which sixteen, with eight fires, are arranged round a common chimney. The products of distillation meet in an iron pipe, which is surrounded by another, so that cold water can run between the two pipes for cooling. The gases, after having passed this pipe, enter into two cylinders, about twelve feet in height and four in diameter, which are filled with iron wire chips, and thence pass through another iron pipe, reaching forty feet high into the air, and provided with a regulator for regulating the draught. The products of distillation run into a general reservoir, so arranged, that the condensed products will have an average heat of 30° centigrade. The oils separate themselves here from the ammoniacal water, and this is thrown over the cooled residue of the drying furnaces, and mixed with it, producing a good manure.

Boydell, James, of Gloucester-crescent, Middlesex. *Improvements in the manufacture of wrought iron frames.* Patent dated December 20, 1853. (No. 2959.)

The inventor rolls wrought iron bars with a longitudinal groove at each end suitable for the sliding in of panels of glass or other material; and in order to make them into the proper form for the uprights of the frame of a hand-glass or other such articles, he further rolls them so as to bend them into angle iron.

Lemaire, Emile Victor Felix, of Rue Drouot, Paris. *Improvements in tanning.* Patent dated Dec. 20, 1853. (No. 2960.)

In carrying out this invention the skins are first soaked and hung up in a dark chamber, heated to about 72° Fahr. by steam, and after they have remained in this chamber for about thirty minutes, they have distributed over them, by means of perforated tubes, "a dilute alkaline solution of potash or soda, marking from one-fourth to one-sixth of a degree Beaumé, and this operation is twice repeated at intervals of thirty minutes; and afterwards, at the same intervals of time, streams of water are caused to fall on the skins," until the process is completed.

Webster, John, of Cornwall-road, Stamford-street, Surrey. *Improvements in acting on drying oils and preparing varnishes.* Patent dated December 20, 1853. (No. 2961.)

This invention consists in subjecting oils and varnishes to heat in a vacuum instead of in a vessel exposed to the atmosphere, as has heretofore been considered necessary.

Burrows, James, of Haigh Foundry, near Wigan, Lancaster, engineer. *Certain improvements in the formation of such metallic plates as are required to be conjoined by riveting or other similar fastening.* Patent dated December 20, 1853. (No. 2962.)

This invention consists in forming those parts of metallic plates through which the rivets are to pass thicker than the remaining portions.

BURROWS, JAMES, of Haigh Foundry, near Wigan, Lancashire. *Certain improvements in the construction of steam boilers or generators, and in the arrangement of furnaces connected therewith.* Patent dated December 20, 1853. (No. 2963.)

This invention consists in forming boilers of the plates described in the preceding specification, and in forming the flues or other heating surfaces of boilers of ribbed or corrugated metal, &c.

THOMSON, ARCHIBALD, of Glasgow, Lanark, North Britain, iron ship-builder. *Improvements in setting out and marking the rivet-holes in the plates used in constructing iron ships, boats, boilers, and other vessels.* Patent dated December 20, 1853. (No. 2964.)

This invention relates to an improved arrangement of adjustable template for setting out and marking the rivet-holes in iron plates.

HUYGENS, R. B., of Holland. *Improvements in machinery for crushing, washing, and amalgamating gold and other ores and substances.* Patent dated December 21, 1853. (No. 2965.)

The novelty of this invention consists mainly in the construction of the trough or basin which is formed with one or more parabolic curves on its interior, thus "presenting angles of ascent and descent for facilitating percussion."

BOCCIUS, GOTTLIEB, of Hammersmith, Middlesex, gentleman. *Certain apparatus adapted to the breeding and rearing of fish.* Patent dated December 21, 1853. (No. 2966.)

This apparatus consists of a vessel formed with apertures on the top and bottom of it, sufficiently small to prevent fish, eggs, or spawn escaping, but large enough to admit water. It is fitted in two or more parts, or with a cover.

KOHNSTAMM, HEIMAN, of Union-court, Old Broad-street, London. *Certain improvements in the manufacture of imitation leather.* Patent dated December 21, 1853. (No. 2968.)

The inventor first boils some linseed-oil, in which he mixes a quantity of lamp-black, sufficient to form a thick paste, taking care to stir the mixture so that the lamp-black may be thoroughly incorporated with the oil. He then spreads on a linen, woollen, or woolly cloth, which is to form the body of the imitation leather, a coat of this paste, and dries and pumice-stones it. A second, third, and fourth coat are then added, the third and fourth containing less lamp-black than the former. Two coats of varnish are subsequently added, and the material is then fit to be enamelled.

LEE, THOMAS VINCENT, of Lockyer-terrace, Plymouth, Devon, civil engineer. *Improvements in the construction of certain machinery and apparatus for the manufacture of bricks and tiles.* Patent dated December 21, 1853. (No. 2969.)

This invention has reference to certain mechanical arrangements; firstly, for mixing, moulding, and cutting bricks and tiles; and, secondly, for firing or burning the same by the application of the heat of surcharged steam.

JONES, JOHN, of Glasgow, Lanark, engineer. *Improvements in propelling vessels.* Patent dated December 21, 1853. (No. 2971.)

*Claims.*—1. A mode of forming screw and similar propellers in two or more sections, one portion being fixed to the shaft, whilst the others can turn upon it so as to assume different positions when propelling and not propelling. 2. Modes, combined or separately, of determining the curves, angles, and outline forms of the propeller blades. 3. Forming the shaft, or a portion of the shaft hollow. 4. Employing small intermediate blades between the main blades.

LEWIS, CHARLES, of Hull, master mariner. *An improved lamp for signalling.* Patent dated December 22, 1853. (No. 2977.)

A full description of this invention was given in the last Number.

MURGATROYD, BENJAMIN, of Bradford. York, dyer. *Improvements in washing or scouring wool, alpaca, and mohair, and fabrics composed entirely or partly of those materials.* Patent dated December 22, 1853. (No. 2978.)

*Claim.*—The use, for the purposes named in the title, "of potash in combination with saponaceous substances in such proportion as to leave an excess of alkali."

BERRY, THOMAS, of Rochdale, Lancaster, machinist, JAMES MANGNALL, of Heywood, said county, manager, and JOHN CHADWICK, of Heywood, aforesaid, manufacturer. *Improvements in winding and twisting wool, cotton, and other fibrous materials.* Patent dated December 22, 1853. (No. 2979.)

*Claim.*—Placing cops or bobbins of woollen or other yarn upon revolving spindles without flyers, for the purpose of imparting an additional twist, the yarn so twisted being wound upon bobbins, or other such suitable surfaces.

GIBBONS, JAMES, the younger, of Wolverhampton, Stafford, lock-manufacturer. *Improvements in locks and latches.* Patent dated December 22, 1853. (No. 2980.)

These improvements in locks consist in

bringing into action one portion of the levers, guards, slides, or other parts which form the essential security of locks before the other portion of the holding parts, and in such an arrangement of the other securing parts, that unless every one of them corresponds with the true key at the time the bolt is passed through that part of its path which it is allowed to move by the portion of the levers, guards, or slides, which is first brought into action, the look cannot be opened or lifted. And the improvements in latches consist in working the bolt by means of a tail-piece attached thereto, or to any portion of the guide.

SHAW, JOSEPH, pianoforte manufacturer, of Hatton-garden, Middlesex. *Improvements in pianofortes.* (A communication.) Patent dated Dec. 22, 1853. (No. 2981.)

These improvements consist primarily in substituting for the ordinary lever of pianofortes a simplex lever, which is connected with the hammer, and serves to bring it back to its rest after the blow is struck; the said lever being adjustable to all descriptions of pianos, either upright or with a down striking action.

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### PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the treatment or preparation of wool and of the wash-waters employed in such treatment.* (A communication.) Application dated December 16, 1853. (No. 2928.)

This invention consists mainly — 1. In the washing of wool and tissues of wool in acidulated solutions of muriatic, sulphuric, and nitric acid. 2. In steeping or soaking wool in acid solutions, with the addition of salts of potass; and 3. In the admixture of the wash-waters containing sulphuric acid with other wash-waters described.

NORRIS, STEPHEN, of New Peter-street, Horseferry-road, Middlesex. *Improvements in lighting and extinguishing gas-lamps.* Application dated December 16, 1853. (No. 2929.)

This invention consists—1. In constructing the bottoms of gas-lamps with a hinged piece of glass, to enable instruments to be introduced into the interior of the lamp for lighting and extinguishing the gas in the burner; and 2. In the use of an improved portable instrument, in which a lighted lamp is placed, and the combination of it with certain parts which are attached to the gas-burner.

PARKES, ALEXANDER, of Birmingham. *Improvements in separating silver from its ores or other compounds.* Application dated December 16, 1853. (No. 2931.)

The inventor says, "I employ from two to five cwt. of galena to one ton of silver ore, and two cwt. of stone coal with fluor spar, oxide of iron, or other fluxing agents, if I find the ore difficult of fusion. The sulphurets of silver and lead thus produced I afterwards treat to obtain the silver, either by fusion of the regulus with metallic iron, to reduce the lead and silver, or I calcine the reguline compound, and reduce with carbon and fluxing agents. The silver is refined in the usual manner."

HALL, ROBERT BURT, of Whitecross-street, engineer. *Improvements in crushing and grinding quartz, minerals, and other matters.* Application dated December 16, 1853. (No. 2932.)

The inventor employs a vessel formed with parallel sides, and a semicircular boundary forming a continuous hollow trough, which carries two spheres within it, and works on horizontal axes, one of which is hollow, and has the charge fed through it.

STIRLING, JOHN DAVIE MORRIES, of the Larches, near Birmingham. *Improvements in the manufacture of iron.* Application dated December 17, 1853. (No. 2941.)

The inventor says, in illustration of his invention, "I have discovered that if the beds of such (refining and puddling) furnaces be covered with, or have applied thereon, oxides of iron or of other metals, or of the earthy bases with sawdust or other ligneous or resinous, tarry or oily, and such like matters, and the molten iron be run thereon, that a material improvement in the manufacture of iron results."

CROSSBY, WILLIAM, miller, Devonshire-street, Sheffield, Yorkshire. *The ventilation of granaries, storehouses, or places of deposit for grain whatsoever, and for improvements in the grinding of grain and dressing of grist, and grinding generally.* Application dated December 19, 1853. (No. 2950.)

This invention appears to consist it the extraction of warm, and the substitution of cold air, by means of a fan and pipes or tubes.

WAYGOOD, RICHARD, of Newington-causeway, Surrey, ironfounder. *Improvements in portable forges.* Application dated December 19, 1853. (No. 2952.)

The upper part of this forge consists of a rectangular shallow vessel or chamber without a cover, and is made, by preference of wrought iron, open at the top and divided internally by two transverse partitions which slide in grooves, by which they are maintained in their proper position, and from which they may be removed when required.

GOLDTHORP, DAVID, of Cleckheaton, near Leeds, York. *An improved propeller.*

Application dated December 19, 1853. (No. 2953.)

This propeller consists of a piece of metal of a shape somewhat similar to the blade of an oar, the upper and lower ends being formed with spindles for connecting it to a frame for supporting it, and to certain other parts employed for imparting a sculling motion to it.

FARRINGTON, CHARLES JAMES, of Hampstead, Middlesex. *Improvements in signalling and preventing collisions on railways by electrical communication.* Application dated December 21, 1853. (No. 2967.)

This invention consists in arranging at intervals along a line of railway, arms which are intended to come in contact with projections formed on a passing carriage, and which are in metallic contact with wires, so that an electric circuit may be completed, and signals communicated when the contact is effected.

DINNING, JAMES, and WILLIAM INGLIS, both of Southampton. *An improved apparatus for purifying and filtering residuous water.* Application dated December 21, 1853. (No. 2970.)

The water is to be collected in a tank or series of tanks, where it is to stand a sufficient time to enable the impurities which it holds in solution to be precipitated by a chemical agent supplied in proper quantities, after which it is to be filtered.

JONES, JOHN, of Glasgow, Lanark, North Britain, engineer. *Improvements in governors or regulators for steam engines and other machinery.* Application dated December 21, 1853. (No. 2972.)

In this invention, when the pressure varies, the drag of a fly-wheel acts through its spur-wheel, and from the latter through an intermediate spur-wheel or a lever, so as to adjust the steam or other valve to suit the alteration.

YOUIL, JOHN, of Burton-upon-Trent, Stafford, common brewer. *Improvements in the mode or method of obtaining power to raise liquids and of treating the said liquids when raised, and of using them to obtain additional power.* Application dated December 22, 1853. (No. 2973.)

By the force of steam the inventor partially exhausts an elevated vessel, and thus obtains in it a partial vacuum, into which the liquid is raised by the atmospheric pressure. He then treats the liquid by boiling it in a partial vacuum in any convenient manner, and thus obtains steam and steam power for any required purpose.

BESNARD, LOUIS ADOLPHE FERDINAND, of Paris, France. *A new system of painting by means of lithography, without leaving a particle of paper upon the canvass.* Application dated Dec. 22, 1853. (No. 2974.)

The inventor takes a prepared canvass thoroughly dry and smooth, and lays it in a press, placing the sheet of paper, with the drawing upon it, on the canvass; by then pressing it the drawing is transferred to the canvass, which is subsequently washed over with a solution composed of half water and half gelatine, and dried.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury, London. *Certain improvements in constructing and applying connecting-rods.* (A communication.) Application dated December 21, 1853. (No. 2975.)

This invention consists in forming compound rods of pieces enclosing lozenge-shaped spaces, and in combining these with jointed rods, a fly-wheel, &c.

WOODHOUSE, WILLIAM HENRY, of Parliament-street, Westminster, civil engineer. *Improvements in the construction of roads, ways, and ducts.* Application dated December 22, 1853. (No. 2976.)

This invention consists in constructing roads, &c., of a combination of metal ribs with wood, concrete, stone, and other suitable material.

BRITTEN, JOHN, of Birmingham, Warwick, engineer. *Improvements in girders, bridges, roofs, and other such like structures.* Application dated December 23, 1853. (No. 2983.)

This invention, in its simplest form, consists in the use of two bow-string girders resting on piers in ball and socket joints, and connected together at their upper parts by a hinge joint. The roadway (if the structure be a bridge) is supported about half-way between the apex and the point of support.

O'NEIL, JOHN, of Bury, Lancaster, manager. *An improvement in apparatus for drawing condensed steam and air from pipes or other chambers in which steam is used.* Application dated December 23, 1853. (No. 2984.)

"The peculiar feature upon which my invention is founded," says the inventor, "consists in the use of a diaphragm which will admit the passage of water and air, but which will resist the passage of steam. I have found that such a condition may be established by using various media which are rendered to a certain extent porous."

## PROVISIONAL PROTECTIONS.

*Dated January* 12, 1854.

77. Joseph Serf, of Paris, France, gentleman. Improvements in seats, or chairs for advertising.

*Dated April* 10, 1854.

835. Louis Marie Trouble, of Paris, France. Certain improvements in stamping-apparatus (or autoperitype.)

*Dated April* 15, 1854.

874. Charles Brutus Goodrick, of Old Kent-road, Surrey, engineer. An improved artizan's tool, which may be used as a measuring rule, straight edge, set square, T square, bevel, and plumb-rule.

*Dated May* 10, 1854.

1041. James Ward Hoby, of Renfrew, North Britain, engineer, and John Milner, of Stanley-street, Pimlico, Middlesex, engineer. Certain improvements in steam engines.

*Dated May* 11, 1854.

1049. Henry Tylor, of the firm of Tylor and Pace, of Queen-street, London, manufacturers. An improvement in chair bedsteads.

*Dated May* 30, 1854.

1194. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in machinery for making bags of paper or other suitable material. A communication.

*Dated June* 2, 1854.

1227. Egmont Websky, of Wustewaltersdorf, Prussia. Improvements in bleaching. Partly a communication.

*Dated June* 14, 1854.

1294. James Barlow, of Accrington, Lancaster, machinist. Improvements in the mode or method of extracting gluten, and preparing the same for sizing purposes.

1295. James Pickup, of Liverpool, Lancaster, engineer. Improvements in steering-apparatus.

1296. John Hargrave, of Kirkstall, York, worsted manufacturer. Improved machinery for washing, scouring, and felting or fulling.

*Dated June* 15, 1854.

1297. Joseph Edwards, of Camberwell, Surrey, gentleman. An improved knife-cleaner.

1298. Frederic Martini, of Elberfeld, Prussia, and Mumford-court, Milk-street, London. An improvement in working steam engines.

1299. Thomas Wilson, of Birmingham, Warwick, engineer, and John Hadley, of Birmingham, engineer. A new or improved method of constructing certain kinds of rolls or cylinders and dies or surfaces.

1300. James Kite, of Princes-street, Lambeth, Surrey, engineer. Improvements in machinery and apparatus for expressing moisture from substances.

1301. John Gedge, of Wellington-street South, Middlesex. Improvements in the construction of locks and latches, spindles and knobs, applicable to doors and other similar purposes.

1302. Samuel Varley, of Stamford, Lincoln, engineer. An improved construction of hay-making machine.

1303. John Davie Morries Stirling, of Black-grange, Clackmannan, Scotland. Improvements in the manufacture of iron. Partly a communication from M. Leon Talabot.

*Dated June* 16, 1854.

1304. John Edwin Piper, of New-road, St. Pancras, Middlesex, operative chemist. Improvements in the preparation of linen, cotton, and other fabrics, to produce a factitious leather.

1305. William Brindley, of Moorgate street, London, machinist. Improvements in applying steam for offensive and defensive purposes.

1306. Richard Hornsby, of Spittlegate Iron-works, Grantham, Lincoln. Improvements in portable thrashing-machines.

1307. Thomas Mara Fell, of King William-street, London, and William Cooke, of Curzon-street, Hanover-square, Middlesex. Improvements in ventilators.

1308. William Cooke, of Curzon-street, Hanover-square, Middlesex. Improvements to boots and shoes.

1309. Charles Hargrove, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of certain kinds of iron.

1310. William Evans, of St. Leonard's-terrace, Chelsea, Middlesex. An improved tap for drawing off liquids.

1311. Frederic Martini, of Elberfeld, Prussia, and Mumford-court, Milk-street, London. A new and improved construction of steam engines.

1312. James Macnee, junior, of Glasgow, Lanark, merchant. Improvements in caps, hats, and other coverings for the head.

1313. Frederick John Julyan, of Gerrard-street, Soho-square, Middlesex, carpenter. Improved methods of producing musical sounds.

1314. William Gilbert Pidduck, of Camberwell, Surrey, gentleman. Improvements in the construction of vent-pegs.

1315. Hesketh Hughes, of Aldersgate-street, London, engineer. Certain improved machinery for cutting and embossing, either separately or simultaneously.

1316. Thomas Parramore, of Castle-street, Southwark. An improvement in the manufacture of air-tight seats, beds, and other articles required to be inflated and air-tight.

1317. David Lowe, of Leicester. Improvements in knitting-machinery.

*Dated June* 17, 1854.

1318. George James Hinde, of Wolverhampton, Stafford, commercial clerk. A new or improved combination of materials to be used for the manufacture of pipes or tubes for drains, or such other purposes as the same is or may be applicable to.

1319. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in treating bitumen. A communication.

1320. John Aspinall, of Tavistock-square, Middlesex, civil engineer. An improved means of creating a vacuum or partial vacuum for evaporative purposes.

1321. Joseph Fourdrinier, of Sherborne-street, Islington, Middlesex. Improvements in machinery for washing, boiling, cleaning, and bleaching rags, fibrous and textile substances.

1322. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in machinery for block-printing. A communication.

1323. John Rawe the younger, of Haverstock-hill, Middlesex, gentleman. Improvements applicable to stoves, stove-grates, or fireplaces for domestic use.

1324. George Holloway, of the firm of Holloway Brothers, of Stroud, Gloucester, clothes manufacturer. Improvements in sewing and embroidering-machines.

1325. John Allin Williams, of Baydon, Wilts, farmer. Improvements in machinery or apparatus for ploughing and cultivating land.

1326. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in water-mill machinery. A communication.

*Dated June* 19, 1854.

1327. Louis Ambroise Henry, of Metz, France, engineer. Certain improvements in constructing railroads.

1329. Sir James Caleb Anderson, of Fermoy, Cork, baronet. An economical railway for the conveyance of passengers, goods, and letters.

1330. George Mears, of the Bell Foundry, Whitechapel-road, Middlesex. Improvements in machinery or apparatus for obtaining sounds.

1331. John Westlake, of Newton Abbott, Devon, mine-agent. Improvements in treating the pul-

verized solution obtained from machines used for crushing ores, gossans, earths, and rocks.

1333. William Bauer, of Munich, Bavaria, engineer. Improvements in propelling vessels.

1334. Prosper Guilhaume Dartiguenave, of Regent-street, Middlesex, gentleman. Improvements in aërial navigation.

1335. Joseph William Schlessinger, of London-wall, London, merchant. A means of readily discovering any street, road, river, locality, or place, on maps, charts, and plans. A communication.

1336. Samuel Riley, of Oldham, Lancaster, agent. Certain improvements in pocket-books, bill-cases, or other such depositories.

1337. Joseph Oliver, of Wapping, Middlesex, manufacturer. An improved construction of signal lantern.

1338. David Bogue, of Fleet-street, London, publisher. An improved apparatus for facilitating the attachment of adhesive stamps. A communication.

*Dated June* 20, 1854.

1339. Henry Worrall, of Staley-bridge, Chester, innkeeper. Improvements in machinery or apparatus for carding cotton, wool, or other fibrous materials.

1340. William Brunton, of Camborne, Cornwall, civil engineer. Certain improvements in metallic pistons.

1341. James Acland, of Langley Cottage, South Lambeth, Surrey, parliamentary agent. Improvements in the manufacture of paper.

1342. Thomas Littleton Holt, of Warwick-square, Paternoster-row, London, and William Charlton Forster, of Hatton-garden, Middlesex. Making paper.

1343. Charles Reeves, of Birmingham, Warwick, manufacturer, and William Wells, of Sutton Coldfield, Warwick, carpenter. A new or improved method of manufacturing certain kinds of metallic tubes.

1344. Joseph Day, of Birmingham, Warwick, manufacturer. An improvement or improvements in certain kinds of candlesticks.

1345. Alexander Stephen, of Kelvinhaugh, near Glasgow, Lanark, shipbuilder, and Alexander Pirnie, of Kelvinhaugh, blacksmith. Certain improvements in the application of materials for and in the arrangement of and method of applying apparatus to be used as templates for ascertaining and marking the proper positions for the rivet and bolt-holes required in the plates, frames, and other pieces or portions of the materials used in the construction or manufacture of iron ships or vessels, boilers, tanks, masts, spars, and other similar articles.

1346. Jean Eugène Jesson, clockmaker, of Paris, France. An improved barometer, called hydrographer barometer.

1347. Nathaniel Clayton and Joseph Shuttleworth, agricultural engineers, of Stamp-end Iron-works, Lincoln. Improvements in portable and fixed combined thrashing, shaking, and winnowing-machines.

1348. Willoughby Theobald Monzani, of St. James's-terrace, Bermondsey, Surrey, gentleman. An improvement in brushes and brooms.

1350. Frederick Braithwaite, of Gower-street, Bedford-square, Middlesex, civil engineer. Improvements in constructing suspension-bridges, roofs, and coverings.

1351. George R. Chittenden, of Wood-street, London. Improvements in sewing-machines. A communication.

1352. Alexander McLaine, junior, of Belfast, Ireland, shipbuilder. An improved mode of constructing and fitting gun-boats.

1353. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved manufacture of pigments or colouring matters. A communication.

1354. George Henry Byerley, of Paris, France, now residing at Brompton, Middlesex, gentleman. Improvements in machinery for the manufacture of bricks, tiles, quarries, tubes, and other such like articles.

*Dated June* 21, 1854.

1356. John McInnis, of Liverpool, Lancaster, oil-merchant. An improved composition for coating the bottoms of iron ships to prevent their fouling, and other useful purposes.

1360. James Whitworth Shaw, of Birmingham, Warwick, merchant. Improvements in apparatus or machinery for producing motive power. A communication from Don Manuel Maria José Trinidad Miciano y-Contillo, of Cadiz, Spain.

1362. Thomas Rhoads, of Vine-street, America-square, London, merchant. An improved method of framing school slates. A communication.

1364. William Parsons, of Paradise-street, Lambeth, Surrey, engineer. Improvements in rotatory engines.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1414. Samuel Smith Shipley, of Stoke Newington, Middlesex, gentleman. Improvements in fittings suitable for dressing-cases, and for other purposes of elegance and utility. June 27, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 4th,* 1854.)

419. Adam Dixon. Improvements in railway axle-boxes and bearing-springs.

420. Adam Dixon. Improvements in timber scaffolding or stageing.

437. Thomas Danson Pruday. Improved apparatus for cooling liquids and edible substances.

449. Benjamin Joseph Green. Improvements in the manufacture of corrugated elastic materials.

459. Charles William Siemens. Improvements in electric telegraphs. Partly a communication.

478. Theobald Denny. Improvements in engraving.

491. John Soden Holbeche. Improvements in the construction of invalid bedsteads, which said improvements are also applicable for couches, chairs, and reclining seats or beds for invalid carriages.

509. Hugh Ellis and John Ellis. Improvements in machinery or apparatus for stretching and finishing woven fabrics.

514. John Tann. Improvements in the construction of locks.

518. Lorenzo Tindall. Improvements in churns.

528. Richard Madeley. An improvement or improvements in the joints and framing of metallic and other bedsteads, chairs, sofas, couches, and such other articles as are or may be used for sitting, lying, and reclining upon.

532. John Knox Stuart. Improvements in hats and other coverings for the head.

535. James Galloway. Improvements in the construction of cocks, taps, and valves.

540. Pierre Amable de Saint Simon Sicard. Improvements in purifying sea and other water.

583. Désiré Parfait Lefevre. An improved railway brake.

615. Peter Armand Lecomte de Fontainemoreau. Improvements in producing waterproof stuffs. A communication.

618. Thomas Stephen Holt and Charles Herbert Holt. Improvements in steam boilers.

684. Frederic Seiler. Improvements in the manufacture and construction of solid and veneered,

laminated and other shaped woodwork, suitable for floorings, buildings, works of art, and other purposes.

716. Henry Francis. Improvements in machinery for crushing, grinding, washing, and amalgamating quartz and other matters containing gold or silver.

773. Henry Young Darracott Scott. An improved mode of manufacturing cement.

835. Louis Marie Trouble. Certain improvements in stamping apparatus (or autoperitype.)

856. Lewis Cruger. A new and improved mode of attaching propellers to ships and vessels of all classes. A communication.

892. John Rowley. Improvements in the manufacture of a material as a substitute for leather.

916. Frederick Buonaparte Anderson. An improvement in spectacles and eye-glasses.

1128. William Crighton and Andrew Crighton. Improvements in machinery or apparatus technically called beaters, used for opening, cleaning, or otherwise preparing cotton wool or other fibrous substances.

1158. Joseph Lillie. Improvements in looms for weaving.

1212. David Duncan. Improvements in railway points or switches and crossings.

1219. Joseph Robinson. Improvements in apparatus for mixing wheat and other grain and matters.

1227. Egmont Websky. Improvements in bleaching. Partly a communication.

1241. Alfred Garratt Barham. An apparatus for damping or moistening the adhesive surfaces of stamps or labels.

1252. Somerville Scott Alison. The manufacture of a new material to be used for external applications in medicine.

1259. Charles Anthony Perpigna. Improved apparatus for effecting the combustion of smoke in fire-places. A communication.

1273. Richard Archibald Brooman. Improvements in machinery for cutting brads, lath nails, and others of similar character. A communication.

1274. Thomas Bramwell. Improvements in the manufacture of the carbonates and prussiates of potash and soda.

1277. John Currie and Robert Young. Improvements in the treatment and grinding of grain, and the products thereof.

1296. John Hargrave. Improved machinery for washing, scouring, and felting or fulling.

1298. Frederic Martini. An improvement in working steam engines.

1306. Richard Hornsby. Improvements in portable thrashing machines.

1309. Charles Hargrove. An improvement or improvements in the manufacture of certain kinds of iron.

1311. Frederic Martini. A new and improved construction of steam engines.

1314. William Gilbert Pidduck. Improvements in the construction of vent-pegs.

1316. Thomas Parramore. An improvement in the manufacture of air-tight seats, beds, and other articles required to be inflated and air-tight.

1317. David Lowe. Improvements in knitting machinery.

1338. David Bogue. An improved apparatus for facilitating the attachment of adhesive stamps. A communication.

1348. Willoughby Theobald Monzani. An improvement in brushes and brooms.

1356. John M'Innes. An improved composition for coating the bottoms of iron ships to prevent their fouling, and other useful purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## HEARINGS OF APPLICATIONS FOR PROLONGATION OF PATENTS.

The Right Honourable the Lords of the Committee of the Privy Council have appointed Wednesday, the 12th of July next, at half-past ten in the forenoon, for hearing the petition of Charles Payne, of Belmont-place, Vauxhall, in the county of Surrey, praying for an extension of the terms of the several Letters Patent granted to him for England, dated 13th October, 1840; for Scotland, dated 11th November, 1840, and for Ireland, dated 25th March, 1841, for "certain improvements in salting animal matters."

The Right Honourable the Lords of the Committee of the Privy Council have appointed Friday, the 1st day of December next, at half past ten in the forenoon, for hearing the petition of William Ryder, of Bolton, in the county of Lancaster, roller and spindle-maker, praying for an extension of the term of the Letters Patent granted to him, dated 8th February, 1841, for "certain improved apparatus for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other like articles in metal."

## WEEKLY LIST OF PATENTS.

*Sealed June 30, 1854.*

3023. William Pickstone and John Booth.
3031. Henry Vernon Physick.
3034. Weston Tuxford.
3038. James Slater.

1854.

11. James Stovold.
16. Thomas Mann.
19. David Hulett.
23. David Blair White.
27. John Mason and Leonard Kaberry.
30. Henry Hind Edwards.
66. William Watt.
72. Felix Tussaud.
213. Wellington Williams.
582. Alfred Vincent Newton.
616. Peter Armand Lecomte de Fontainemoreau.
781. William Edward Newton.
790. Alfred Vincent Newton.
822. William Edward Newton.
825. Alfred Vincent Newton.
838. Alfred Sohier Bolton and Francis Seddon Bolton.
987. William Edward Newton.

*Sealed July 4, 1854.*

1854.

53. William Brown.
60. Ralph Lister.
277. George Mills.
289. James Balie Graham.

827. John Platt.
939. William Edward Newton.
943. Richard Ford Sturges.
993. William Westley Richards.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.



CONTENTS OF THIS NUMBER.



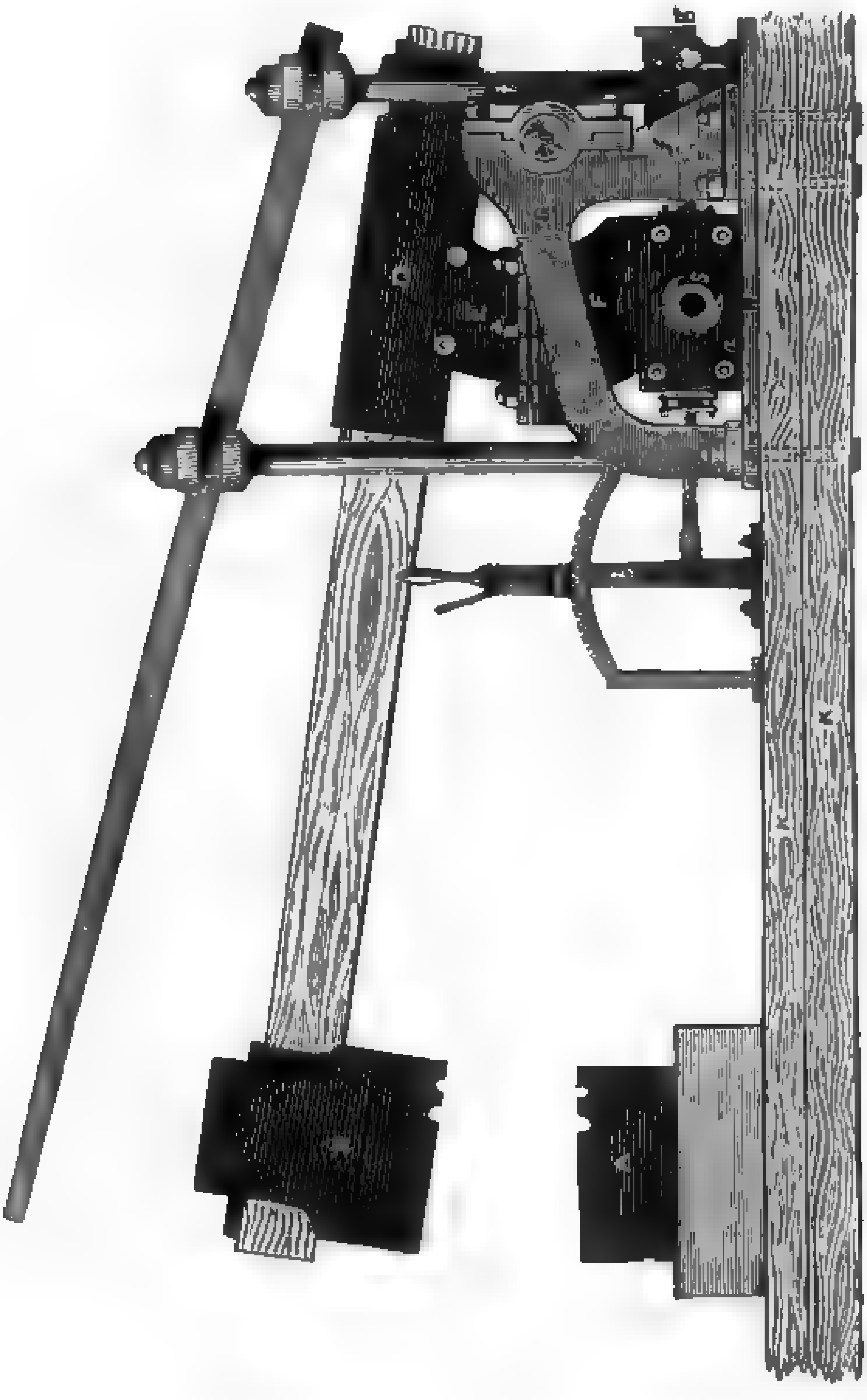
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1614.] SATURDAY, JULY 15, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## SYKES' STEAM HAMMER.



## SYKES' STEAM HAMMER.

We publish this month an engraving (see preceding page) of a very ingenious arrangement of a steam hammer, which has been invented and patented by Mr. Sykes, Superintendent of the Toronto Locomotive Works.

This hammer is not proposed to equal in the range of its application the steam hammer invented by Nasmyth; but it accomplishes in a much cheaper and more simple form many of the objects attained by that patent.

The chief advantages of this arrangement are, First. The direct application of the steam without the intervention of a steam engine, and its consequent fly-wheels, belts, and gearing. Secondly. The arrangement of the steam valves in such a form as to admit of a perfect adjustment of the height of the stroke and the vigour of the blow given. This adjustment is not, perhaps, quite so perfect as that of Nasmyth's; but it is sufficient for all practical purposes. As compared with Nasmyth's, its disadvantages are that it does not give a square or parallel blow, and the forging of square work must therefore partake of the angularity of the face of the anvil to that of the hammer in proportion to its thickness, unless the hammer head is changed with each change in the dimensions of the work to be done. This, however, is only true in the case of work requiring parallel faces, and does not affect the forging of shafts or other round work. The nature of this arrangement also prevents its application on so large a scale as in Nasmyth's hammer. For ordinary work, however, and for shafts which do not exceed ten or twelve inches in diameter, the small cost of this hammer will, we think, be sufficient to insure its extensive use.

*Literal References.*—A, anvil block. B, hammer head. These may be of such form as is desirable for swaging the work to the required form. C, a spring of flexible timber, against which the hammer head strikes in its upward stroke, and is intended to overcome the momentum of the hammer, which would otherwise throw the piston out of the stuffing-box. D, a cast-iron socket, which carries the hammer arm, the centre, O, on which it oscillates, and the piston. E, the piston, made square and concentric with the centre, O, and can be completely finished in the lathe. F is the steam chest, in which the piston works, being furnished with a stuffing-box and gland of the ordinary construction. *a*, valve-chest, containing double slide valves, the adjustment of which in relation to each other regulates the stroke of the hammer. *b*, valve-lever, the position of which on the arc, *c*, regulates the relative position of the valves. *d*, the under-valve rod. *e*, exhaust-pipe for waste steam. *f*, lever attached to the main centre, O, by which the oscillations of the shaft communicate the requisite motion to the upper slide valve by acting on studs placed in the proper position on the valve-spindle, *g*. *s*, steam pipe. G, main centre frame of metal. H, Foundation-plate. K, foundation of timber or stone. *t t*, iron columns, by which the spring, C, is secured.—*Journal of the Franklin Institute.*

## THE CONSTANTS OF NATURE AND ART.

Nearly thirty years ago, Mr. C. Babbage, in a paper, of which a limited number of copies were circulated, suggested the expediency of scientific men of all countries combining to form a great collection of facts under the above title.

Amongst those works of science, (said the author,) which are too large and too laborious for individual efforts, and are therefore fit objects to be undertaken by united academies, I wish to point out one which seems eminently necessary at the present time, and which would be of the greatest advantage to all classes of the scientific world.

I would propose that its title should be, "The Constants of Nature and Art." It ought to contain all those facts which can be expressed by numbers in the various sciences and arts. A better idea will be formed by giving an outline of its proposed contents; and it may, perhaps, be useful to indicate the sources whence much of the information may be drawn.

These constants should consist of—

1. All the constant quantities belonging to our system; as distance of each planet, period of revolution, inclination of orbit, &c.; proportion of light received from the sun, force of gravity on surface of each.

These need not be further enumerated, as they have already been collected, and need only be copied.*

2. The atomic weights of bodies.

These may be taken from Berzelius, Thompson, or Turner.

* A work of this kind, embodying the results of science, has been projected for some time by M. Poggendorff, of Berlin, and a specimen of it may be seen in his "Annalen," xxi. p. 609.

The proportions of the elements of various compounds;—acids with bases, metals with oxygen, &c.

These may be taken from the best treatises on chemistry.

3. A list of the metals, with columns containing specific gravity, elasticity, tenacity, specific heat, conducting power of heat, conducting power of electricity, melting point, refractive power, proportion of rays reflected out of 1,000, at an incidence of 90°.

3. List of specific gravities of all bodies.

4. List of refractive indices, dispersive indices, and polarizing angles.

4. List of angles formed by the axes of double refraction in crystals.

These may be extracted from the writings of Brewster, Mitscherlich, Herschel, Biot.

5. Number of known species of mammalia, birds, reptiles, fishes, &c.

These classes might be further subdivided.

Additional columns should show how many of each are found in a fossil state, and the proportion between the fossils of existing and extinct species.

6. List of mammalia, containing columns expressing height, length, weight, &c.

It would be desirable to select some bone for the unit of weight, and perhaps of measure, and to give the proportion of all the other bones to this standard one. The numerical relations thus established might, perhaps, in some cases identify the sexes, or even the races of the human species, when only a few bones were found. It would also be highly interesting to compare the relative weight of the bones of persons employed in different trades, and of persons dying from certain constitutional diseases.

7. Of man. Average weight at various periods of existence, height of ditto, tables of mortality in various places, &c.

8. Power of man and animals.

9. Vegetable kingdom. Number of species known of monocotyledonous plants, number of species of dicotyledonous plants, &c., &c.

10. Tables of the geographical distribution of animals and of plants, of the average period of maturity and decay in various woods, &c.

11. Atmospheric phenomena.

12. Materials.—Height to which a column of any substance used in building may be carried before the lowest layer is crushed,—weight necessary to crush a cubic inch of each, weight of cubic foot or cubic yard, &c.

See Rennie, Tredgold, Prony, Eytelwein, Venturi, &c.

13. Velocities. — Arrow, musket-ball at several distances, cannon-ball, sound, telegraph, light,—birds.

14. Length of all rivers, — water discharged per hour. Seas — proportion of water to land on globe,—area of all seas and lakes in square miles,—areas of all islands and peninsulas and continents,—heights of mountains,—depth of mines from surface,—quantity of water pumped out of mines.

Heights of above 7,000 points in Europe may be found in *Orographie*, the third volume of the *Transactions of the Geographical Society of Paris*.

15. Population, extent in square miles, revenue, &c., of kingdoms,—births, deaths, marriages,—rate of increase, population of great towns.

16. Buildings.—Height of all temples, pyramids, churches, towers, columns, &c.

17. Weights, measures, &c.—Factors and their logarithms to convert all money of every country into English pounds sterling, &c.

18. Tables of the frequency of occurrence of the various letters of the alphabet in different languages, &c.

19. Table of number of books in great public libraries at given dates,—number of students at various universities. Observatories of the world,—transit, its length, diameter of object-glass, maker,—circle, length of telescope, aperture, diameter of divided circle, maker.

It would be desirable to give the date of the different eras by which time is computed, and perhaps tables of the reigns of sovereigns. Also a chronological table,—at least of scientific discoveries and their authors.

In the above enumeration * (continues the Author), which is far from complete, some few of the uses of such a volume are noticed; others will present themselves to every reader, and probably many unexpected ones will arise. The facts being all expressed in numbers, if printed in a small type and well arranged, would not occupy a large space. Most of the constants mentioned in this list already exist, and the difficulty of collecting them would consist chiefly in a judicious selection of those which deserve the greatest confidence. The labour of extracting them from a great variety of volumes, and of reducing the weights and measures of other countries to our own, could be performed by clerks. To any individual who might attempt it, it must be a work of great labour and difficulty, and there are few persons possessing the varied knowledge which such a task implies, whose talents might not be differently employed with more advantage to science. It is also certain that such an assemblage of facts, emanating from the collected judgment of

* We have greatly abridged the preceding list from the author's paper. Ed. M. M.

many, would naturally command greater attention than if it were the produce of any single individual, however eminent.

It appears, then, that such a work is particularly fitted to be the production of a body of men of science, and I would appeal to the great academies of Europe whether they would not, by combining in one volume so vast a collection of facts, confer an important advantage upon science and upon all who are occupied with its pursuits. I would suggest that three of the academies of Europe, perhaps the Royal Society, the Institute of France, and the Academy of Berlin, should each publish at intervals of six years their own table of the CONSTANTS OF NATURE AND ART. Thus these publications might succeed each other at intervals of two years, and the man of science would always be able to refer to the most recent determinations of the constants he employs.

In order to execute the work, sub-committees of one or two persons must be appointed to each department, who should be directed in the first instance to prepare the outline of the constants they propose to insert. These views should then be considered and classed by a small committee, consisting of persons of general views and of various knowledge. The sub-committee should then collect and reduce to certain standards the constants committed to them, and the whole should be printed under the general superintendence of the committee, but each part should be specially revised by its own sub-committee.

A preface should be prepared, stating as shortly as possible the reasons for preferring or rejecting particular experiments or observations, and also, generally, the degree of accuracy the several subjects admit of. A good and concise system of references should be made to all the authorities for the numbers given. Whoever should undertake the first work of this kind would necessarily produce it imperfect; partly from omission, and partly from the many facts connected with natural history, which, although, measured by number, have not yet been counted.

But this very deficiency furnishes an important argument in favour of the attempt. It would be desirable to insert the heads of many columns, although not a single number could be placed within them,—for they would thus point out many an unreaped field within our reach, which requires but the arm of the labourer to gather its produce into the granary of science.

It is, however, to be hoped that no fear of the imperfection of a first attempt will deter either any individual or any body of men from an immediate endeavour to produce a work fraught with so many advantages to knowledge. The task of revising it at each period of six years will be comparatively easy, and the discussions of new observations or additional experiments made during those intervals, will have an admirable effect in exciting the ambition of the inquirers to bestow such care as shall claim for their results a place in the volume, in which the academy shall record the condensed expression of the knowledge of their age and nation.

If I should be successful in inducing any scientific academy to enter on the task, I am confident that many a weary hour, now wasted in the search for existing knowledge, will be devoted to the creation of new, and that it will thus call into action a permanent cause of advancement towards truth, continually leading to the more accurate determination of established facts, and to the discovery and measurement of new ones.

The saving of time and labour that would be effected by the realization of Mr. Babbage's method would indeed be vast, and the advantages arising from such an economization of the toil of individuals, who would be thereby enabled to devote themselves uninterruptedly to speculative and inductive pursuits, would be incalculable. It is very gratifying to find that the author revived the suggestion in a paper furnished last year to the Brussel's Statistical Congress, we hope not without valuable results. For, as Mr. Babbage there remarked:

The present time offers a far more favourable combination of circumstances. Science itself is cultivated by a much larger number of persons. Stationary scientific societies have become more special in their particular objects. Other societies assembling periodically in different cities have brought into personal acquaintance men of all countries following kindred pursuits. The newest feature of the times (congresses for special objects) bring together men who have deeply studied those objects, who have felt the want of union as an impediment to their advancement, and who assemble together to agree upon principles and methods of observation, which, whilst they shorten the labour of individual research, contribute towards rendering most productive the united efforts of the collective body of inquirers.

As a practical example of the method proposed, Mr. Babbage placed before the Congress a skeleton of facts susceptible of measure appertaining to mammalia alone, which, he said, might occupy usefully a large number of different inquirers. If

those distinguished men who are at the head of the great schools of comparative anatomy would suggest to their pupils the measurement and weight of the various skeletons of animals occasionally coming under their control, much advantage would be derived from the exercises afforded to the students, whilst, by causing these successive measurements of the same individual to be made and recorded by several pupils, any casual error would be corrected.

The directors of zoological gardens and other menageries might readily supply a daily account of the food consumed by the animals, whilst every intelligent visitor might himself count and register the inspirations of the animals. Even in the farmhouse and in the country village several of these inquiries might be successfully pursued. The proportion of the sexes amongst our poultry and our domesticated animals, the rates of their pulse and their inspirations, are at present unrecorded in works of natural history.

In order to promote and render useful these contributions of individuals, it is essentially necessary that some centre of action should be arranged, to which all communications should be addressed, and by which they should be recorded from time to time in the periodical publications of the day. When a sufficient number had thus accumulated, a special memoir on the subject might be contributed to some philosophical society, in which the deductions arising from these facts might be pointed out, and the most interesting direction of further researches indicated.

It is scarcely to be expected that any one individual will, even for a single animal, be able to fill up the whole of the measures pointed out in this short paper, and it would be much to be regretted if this enumeration should, from its extent, discourage any observer. As, however, some definite portions of this labour, within reach in the course of the next twelvemonth, might perhaps, if accomplished, supply a stimulus to more extensive inquiries, I would propose to those who possess microscopes the determination of the diameter of the globules of the blood of various animals; and to those who are not in the possession of such instruments, or cannot spare the time necessary for their use, I would propose the determination of the rate of breathing of various mammalia. The numerous collections of animals now distributed over the continent would render this limited portion of the task a work of comparatively little difficulty.

We commend the consideration of the system proposed, to our readers, and would anxiously bespeak their co-operation in a work to which the necessities of the time very urgently point, and which, if the present generation do not commence it, will become a more onerous task for those who come after us.

## RAMSBOTTOM'S IMPROVED PISTON FOR STEAM ENGINES.

A Paper descriptive of an improved piston invented by Mr. Ramsbottom, of Manchester, was read by the inventor at the General Meeting of the Institution of Mechanical Engineers, Birmingham, in May last.

The importance (said the author) of having the piston of a steam-engine, upon which its satisfactory performance so much depends, made as light, as simple, as steam-tight, and as free from friction as possible, will no doubt be generally admitted, and by none more readily than those who, like the writer, have charge of locomotive engines.

The piston, which is the subject of the present paper, goes far to secure these advantages, and has realised, so far as time would allow, all that the writer expected from its introduction. It has been his leading object to reduce as far as possible the amount of rubbing surface, preserving at the same time, as nearly as practicable, the same pressure per unit of surface, in order to prevent the passage of steam. This has been done for an 18-inch piston in the proportion of about 141 to 42, and the friction, which may fairly be assumed as proportioned to the extent of rubbing surface, has been reduced accordingly.

The piston is shown in the accompanying engraving, and consists of a single casting A, without cover, bolts, or nuts; it is fixed upon a conical part of the piston-rod by a nut. Three separate grooves, B, B, B, each a quarter of an inch wide, a quarter of an inch apart, and five-sixteenths of an inch deep, are turned in the circumference, and these grooves are fitted with elastic packing rings. These rings, which may be made of brass, steel, or iron, are drawn of a suitable section to fit the grooves in the piston, and are bent in rollers to the proper curvature, the diameter of the circle to which they are bent being about one-tenth larger than the cylinder. They are placed in the grooves in a compressed state, and along with the body of the piston are thus put into the cylinder, care being taken to block the steam port, so as to prevent the rings from getting into it. The rings are therefore forced outwards by their own elasticity, which is

found quite sufficient to keep them steam-tight.

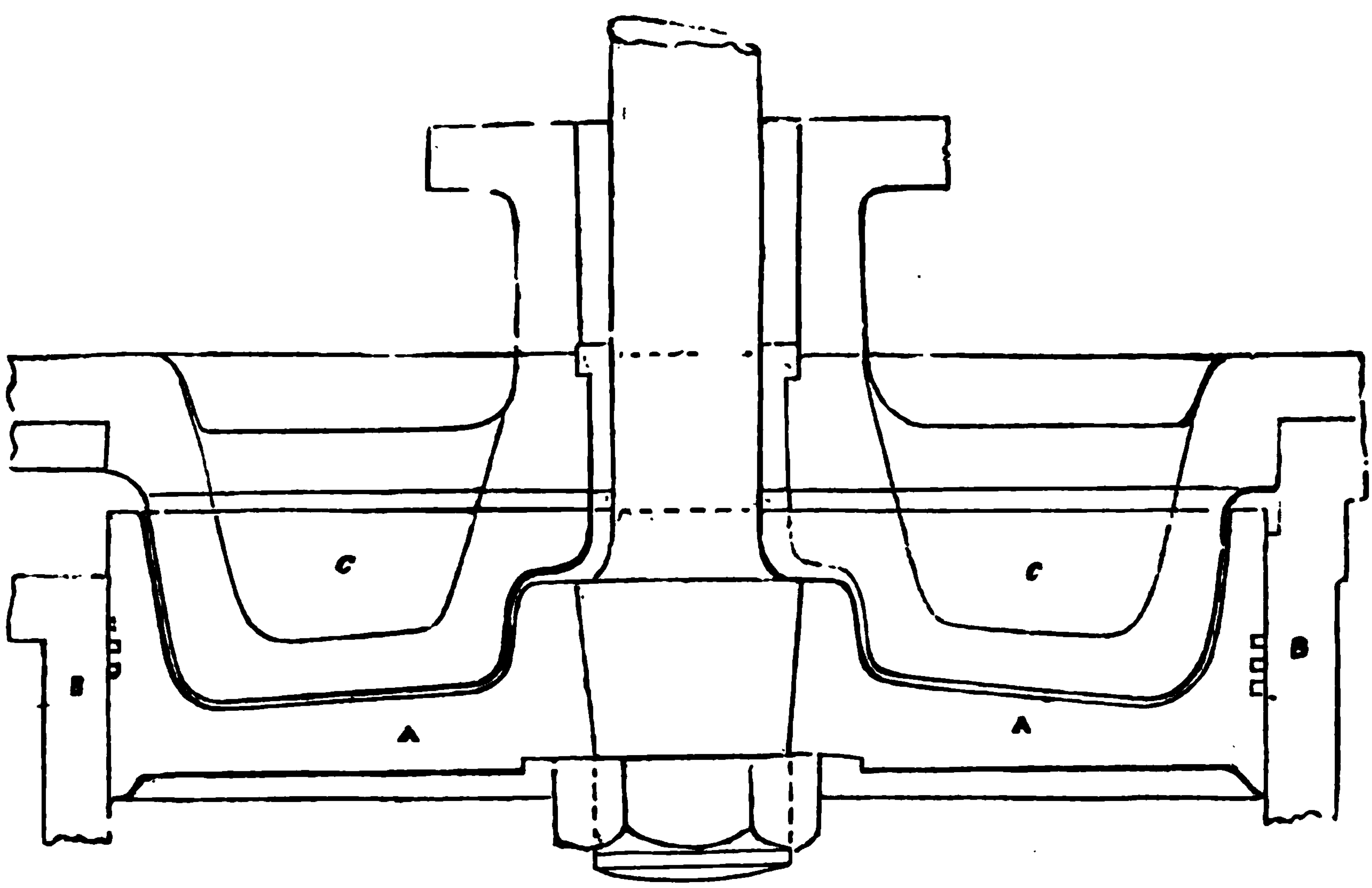
The joints of the rings are placed in some part of the lower half of the cylinder so as to break joint. The body of the piston, esting as it does upon the bottom of the cylinder, prevents the steam getting at them; should it, however, by any chance pass the joint of the first ring, it is all but impossible for the solid part of the piston to be so far out of contact as to allow access to the second, and of course still more so to the third joint.

In applying this piston to engines with the ordinary flat covers, the form already described is preferred, and in order to fill up the recess in its inner side and prevent waste of steam, a block, CC, is riveted to the inner cover. The front cover having no block attached to it, is not increased in weight, and is therefore more easy to handle. When, however, the covers are adapted to the piston, it is considered best to have the disc in the centre of the piston, as it may be made rather lighter.

The advantages obtained in this piston are:

1st.—Lightness; a 15 inch piston of cast iron weighs only 88 lbs. on the new construction, and the lightest the writer had previously in use weighed over 119 lbs. If made of wrought iron or brass the weight might be still further reduced.

2nd.—Simplicity and economy of construction; the piston consisting only of one piece with the three rings, and having no workmanship upon it except turning the rim and boring the centre. The packing rings being drawn as ordinary wire, and then bent, can be produced at a cost little more than nominal.




3rd.—Impossibility of getting deranged in consequence of there being no loose parts, such as bolts, nuts, cotters, or pins, which might come out and cause damage; and no parts that can become unfastened, as each ring is effectually secured in a separate groove.

4th.—Less friction, both from the reduced weight of the piston and the less amount of elastic surface pressed against the cylinders. This latter for an 18-inch piston is about as 42 square inches to 141 square inches, when compared with an ordinary piston with packings 2¼ inches deep, and from the results shown in the working, the writer is of opinion that it is mainly to this that its satisfactory performance is owing.

It is now sixteen months since the first pair were put to work, and others have since been made to the number of thirty pairs, the whole of which are realising all that could be desired. The piston now shown has been at work fifteen months, and has run a distance of 19,650 miles. A set of rings will run from 3,000 to 4,000 miles, and cost, when new, about 2s. 6d.; so that in examining and cleaning a piston, the renewal of the packing is of little more consideration, so far as cost is concerned, than if the piston were hemp-packed.

A careful average of the consumption of the fifteen engines which were first fitted

with these pistons, and which have since run intervals of time varying from four to sixteen months, and an aggregate distance of 269,800 miles, shows a reduction, when compared with the duty of the same engines for four years previous to these pistons being put to it, of 5·7 lbs. per mile; a result which has been carefully arrived at, and which goes to show that this piston, either from greater average tightness or reduced friction, or both combined, is greatly superior to those which it has superseded.

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After the reading of the paper, Mr. Ramsbottom showed a new specimen of the pistons, and also one of them that had been fifteen months at work, with the old and new packing rings.

The Chairman inquired, whether the particulars of the working of the same engines before and after the new pistons were applied could be given, so as to enable a complete comparison to be made?

Mr. Ramsbottom showed a statement of the consumption of fuel in the engines with the new pistons since the alteration, and for four years previously, showing the general result of an economy in consumption of 12 per cent., where there had been no material repair or other alteration made to the engines.

Mr. Jobson thought the difference appeared too great to be attributable entirely to any improvement in the construction of pistons, unless the engines were much out of order previously.

Mr. Ramsbottom said the engines were in average good order both before and after the alteration of the pistons, and he was not aware of any other cause for the economy that was perceived. There were now upon various railways about 120 of the new pistons at work, which he believed had all proved quite satisfactory.

Mr. Everitt inquired whether any trial had been made of the new pistons in stationary engines?

Mr. Ramsbottom replied that only one or two had been tried at present in stationary engines; the largest of the pistons yet made was 18 inches diameter.

Mr. Mathews asked whether the new construction of piston was considered more applicable to locomotive than to stationary engines?

Mr. Ramsbottom said the horizontal position, as in the locomotive engines, was best for it, as the piston body then completely closed the joints in the rings, all the joints being placed in the lower half of the circumference; only one vertical engine and a steam hammer, he believed, had been tried at present with the new piston, but no difficulty had been found in keeping them steam-tight. One great advantage was the lightness of the new piston, which was more particularly valuable in locomotive engines; the 18-inch pistons weighed only 121 lbs. each, instead of about 260 lbs., the usual weight, being a saving of more than half the weight.

The Chairman inquired what was the comparative cost of the pistons?

Mr. Ramsbottom replied, the actual comparison would vary with the different construction of piston, but none of the others he had in use were less than three times the cost of the new pistons. The great saving in cost arose from the new piston having no fitting about it, and the only work put upon it was boring the centre and turning the circumference; the packing rings were merely iron wire, finished by the process of drawing, and only requiring to be bent to the proper curvature by passing through bending rolls.

Mr. Payne asked whether the packing-rings were increased in thickness in proportion to the size of the cylinder?

Mr. Ramsbottom said he had only yet tried one size of ring, and this had been found sufficient, as the diameters of cylinders had only varied from 12 to 18 inches; but for much larger cylinders a different size of packing-ring would doubtless be advisable.

Mr. Chellingworth inquired whether any provision was made for preventing the rings from turning round, so as to avoid the risk of the open joints of the rings getting opposite one another?

Mr. Ramsbottom replied, that some of the pistons had been made at first with only two rings instead of three, and it had been originally intended to have a stud riveted into each groove, to prevent the rings from turning round; this had not been found requisite, and therefore had not been carried out. Indeed, it was just as well that the rings should shift a little, as the working faces were thereby improved; even if the three joints should get all opposite at any time, which was very improbable, the total leakage of steam could be only very insignificant in that construction of piston.

Mr. Mathews remarked, that the same action which had the effect of turning round the rings, would also separate the joints from one another, and prevent any escape of steam from their simultaneous exposure at the same point.

The Chairman said he thought the piston was a very ingenious invention, and its great simplicity and lightness was a great recommendation, and would make it very advantageous for several situations. He proposed a vote of thanks to Mr. Ramsbottom, which was passed.

## SUBSTITUTES FOR FLAX AND HEMP: MATERIALS FOR PAPER.

The following important letter has been addressed to the Right Honourable Sir Charles Wood, Bart., M.P., President of the Board of Control for the Affairs of India, by Samuel Gregson, Esq., M.P.:

Dear Sir Charles,—Among the many important questions now pressing upon public attention, there are two which I venture to bring particularly under your notice, both for the interest of India and of the public at large. They are,—the means of providing an effective and ample substitute for flax and hemp for our manufactures, and of obtaining the necessary quantity of material, now notoriously inadequate, to supply the demand for the production of paper.

The war with Russia affects in a material degree our command of those important articles, flax and hemp; while the rapidly and largely increased consumption of paper without any corresponding extension, but rather a diminution of the supply of the raw material for its production, operates prejudicially on what may now be called a necessary of life.

Allow me to submit to you a few facts bearing upon each of these matters.

The growth of flax has rapidly increased within the last few years in the United Kingdom, and especially in Ireland. In 1849 the quantity of land in Ireland under this crop was 60,314 acres; and taking its average yield at 6 cwt. per acre, the produce would be 18,094 tons. In 1853 there were 174,423 acres under flax cultivation, yielding, at the same average, 52,327 tons.

The importation of foreign flax for the last three years has been

| | From Russia. Tons. | All other parts. Tons. | Total importation. Tons. |
|---|---|---|---|
| In 1851 | 40,934 | 18,775 | 59,709 |
| 1852 | 47,426 | 22,703 | 70,129 |
| 1853 | 64,399 | 29,770 | 94,169 |
| Total in 3 years | 152,759 | 71,248 | 224,007 |
| Average per annum | 50,920 | 23,749 | 74,669 |

showing that the importation last year from Russia was 16,973 tons more than that of the year preceding—13,479 tons above the average of the three years—and within 10,270 tons of the total average importation from all parts of the world.

Putting out of view the growth of flax in Great Britain, of which we have no available information, the importation, and the Irish production together, of flax during the last year amounted to 146,496 tons, of which entire quantity nearly one-half, and of the total importation more than two-thirds, came from Russia, its market value (at *peace* prices averaging £30 per ton) amounting to nearly £2,000,000.

Then, for hemp. Of the articles passing under this general title, including Sunn and Jute, from India, and that known as Manilla hemp, the quantities received from Russia do not bear the same proportion as in the case of flax: being

| | From Russia. Tons. | All other parts. Tons. | Total importation. Tons. |
|---|---|---|---|
| In 1851 | 33,229 | 31,442 | 64,671 |
| 1852 | 27,198 | 26,516 | 53,714 |
| 1853 | 41,819 | 21,323 | 63,142 |
| Total in 3 years | 102,246 | 79,281 | 181,527 |
| Average per annum | 34,082 | 26,427 | 60,509 |

Here again, however, we see that Russia has supplied considerably more than half the entire importation, realizing last year upon 42,000 tons, at *peace* prices, averaging £35 per ton, a market value of nearly £1,500,000.

It appears then that last year we received from Russia of these two articles

| | | | |
|---|---|---|---|
| Flax .. .. | 64,399 tons | —at a cost of | £1,931,970 |
| Hemp .. .. | 41,819 „ | „ | 1,463,665 |
| Total .. .. | 106,218 „ | value | £3,395,635 |

and the present war price has enhanced that value to upwards of £6,500,000.

Next, as regards paper. We are, comparatively, little dependent upon other countries for the direct supply of material in the state in which it is used in the manufacture of this most important article. Without particularly specifying the quantities of rags imported, chiefly from Germany and Italy, it may be taken at less than a twelfth part of the entire weight of material of all kinds used for paper-making. But, small as that importation is in proportion to our wants, we are not suffered to retain it. The Americans are large buyers of rags in this country, whether of those imported or of our own production is immaterial; the general consumption in the United States, so enormous is the quantity used for newspapers, exceeding their own internal supply.

With this state of things is to be coupled the vast increase in the consumption of paper in this country. In the five years, 1830 to 1834, prior to the reduction of the Excise duty on first class papers from 3*d.* to its present equalized rate of 1½*d.* per lb., the average annual quantity made was 70,988,131 lbs.; and in the last five years, 1849 to 1853, the average annual quantity made was 151,234,175 lbs. The production of the year 1853 was 177,623,009 lbs., being above 23,000,000 lbs. (more than 10,000 tons) over that of the preceding year, and more than 36,000 tons over 1834;—such excess requiring for its production not less than 13,000 tons of raw material in the former case, and nearly 47,000 in the latter. The whole weight of material employed in the manufacture of paper only may be stated at between 110,000 and 120,000 tons per annum. And a curious proof of the urgency with which additional sources of supply are needed, is furnished by an advertisement in the *Times* of Friday, July 7th, which I append to this letter.

It results, then, from these several statements, that for our textile manufactures, rope and twine, and paper makers, we are short of the requisite supplies of raw material, as compared with our position at the beginning of last year, to the extent of nearly 120,000 tons, namely:

| | tons. |
|---|---|
| Last year's import from Russia of hemp and flax, as above | 106,218 |
| The above excess for the make of paper | 13,000 |
| Deficiency | 119,218 |

subject only to such diminution of that quantity as Russia may find means to convey to us by circuitous routes. With a liberal allowance for this possible diminution, we may fairly consider ourselves deficient to the extent of a quantity ranging between 80,000 and 100,000 tons of fibrous matter.

This being our position, it is a subject of much interest to determine in what way so large an actual or impending deficiency can be supplied.

To this point I proceed now to draw your attention; and if the facts which have come before me are substantially correct, of which there seems to be no reasonable doubt, it would appear that not only can we obtain adequate supplies from India, but that something like reproach attaches to us for having permitted ourselves so long to neglect to procure, to some extent, at least, these essential commodities from that great country.

Dr. Forbes Royle—whose reputation as an experienced Indian botanist is too well established to stand in need of any individual testimony, and whose valuable Paper on this subject, recently read before the Society of Arts,* I will, as it is already out of print, circulate with this letter throughout India—has distinctly proved the existence in various parts of our Indian Empire, not only of the identical plants which furnish flax and hemp, but of numerous other plants yielding fibres of great importance; some of them greatly superior in strength and general value to either of those articles.

The proof of this is too important to be omitted here. Having submitted a variety of fibres to be tested, the weight each broke with he ascertained to be as follows:

*Fibres in equal weights and of equal lengths tested at the East India Company's Military Stores.*

| | lbs. |
|---|---|
| Petersburgh, broke with | 160 |
| Jubhulpore hemp, from Mr. Williams | 190 |
| Wuckoo nar fibre, Travancore | 175 |
| Mudar or Yercum fibre, common all over India | 190 |
| China grass, Boehmeria nivea | 250 |
| Rheea fibre, the same from Assam | 320 |
| Wild Rheea, Boehmeriæ species from Assam | 343 |
| Kote Kangra hemp (no breakage at) | 400 |

East India House, Dec. 16th, 1853.

It is true that some of these Indian plants are grown in places remote from the seaboard, and from which there are still very bad roads, or no roads at all, for transport; but several of them, and amongst them perhaps the most prolific of all, are of very extensive growth in parts contiguous to the coast, and therefore capable of being beneficially and cheaply prepared for exportation.

The most conspicuous of these is the

* Vide "Journal of the Society of Arts," No. 73, page 366.

*Plantain*, which yields a valuable fibre, and is everywhere cultivated in the plains of India for its fruit, an article of universal consumption by the native population. It is a tree which bears fruit only once, and as soon as that is removed, it is, and has been from time immemorial, cut down and left to rot upon the ground. Persons who have paid close attention to the subject, state that there will be no difficulty in obtaining from this plant alone any required quantity of fibre of admitted valuable quality, and as fast as the mechanical appliances necessary for its preparation can be sent out.

Upon this essential point I have reason to believe that machinery is devised and patents are secured for the processes of preparation, calculated to carry on every necessary operation both as regards fibre for textile purposes and pulp for paper, in a perfect manner; and at a cost which, even under any conceivable rise in the price of the raw material in India, must command such a profit as to ensure its continuous and almost unlimited production.

Some statements have also been prepared, and are readily producible, showing a very tempting pecuniary profit to induce parties in India to provide the material required and that the simple and efficient machinery to be employed may be furnished at a moderate cost.

Applicable as this fibre is to the manufacture of every species of cloth or other article usually made from flax or hemp, and of equal quality, it can be used with no less facility and advantage in the manufacture of paper; thus supplying both the one and the other of the important desiderata which the foregoing facts and figures establish.

We have, therefore, within the limits of our own possessions, in the East Indies and in the West, ample means of furnishing at a low price as much of this important product as our utmost wants can require.

Permit me, in conclusion, to add, that this question, involving as it does the interests of India, which, in your high position as President of the India Board, I know you watch over with anxious solicitude, embraces also the interests of the whole empire, especially at this moment; and I feel assured of its receiving, as it well deserves, your prompt and earnest attention, and the continued favourable consideration of the East India Company, and of Her Majesty's Government.

I am, dear Sir Charles,

Yours very faithfully,

SAMUEL GREGSON.

## ON THE MATERIAL AIDS OF EDUCATION.

BY DR. WHEWELL.

THE following is an abstract of the inaugural lecture of the Educational Exhibition, lately opened under the auspices of the Society of Arts, at St. Martin's-hall, Long Acre. It was delivered on Monday last, to a crowded and influential assembly.

Dr. Whewell commenced by explaining the signification of the term "education," in the sense in which he proposed to apply it; and viewing it as a means of elevating human nature to the highest attainable standard, without reference to proficiency in any particular art, he said, "The objects of education should be to make man participate in and appreciate what is rational, true, beautiful, and good." The inculcation of those four qualities he considered to be essential in every perfect system of education, and he proceeded to examine each one separately, to show their importance, and the means of instilling those principles into the mind. The cultivation of reason depends essentially on the knowledge of language, and in the first lessons a child learns from his mother he is taught to exercise the instrument of human reason, which is the element of all his future knowledge. Language is the manifestation of rationality in man; and though the acquirement of language may be considered as spontaneous education, to which every one attains, if the subject be pursued further and the history of language and its derivations be studied, a higher branch of knowledge is opened, and reasoning faculties of a higher order are brought into exercise. Dr. Whewell pursued the subject of language at some length, with a view to show the peculiar structure of the English tongue in its relation to what are usually called the "dead" languages. The main structure of the language is Saxon; but the superficial part, all that gives it a living character, is derived from the Latin. As an illustration, Dr. Whewell adduced the comparatively modern words *pre*-paid and *post*-poned, the adjuncts to the words which give them their peculiar significations, being derived, in these as in all similar instances, from what is commonly considered a dead language. The next principle taught by education, that of truth —especially in reference to the truths of science—is mainly assisted by those visible aids which it is the object of the Educational Exhibition to supply. Dr. Whewell alluded to the rude orrery noticed by Cicero, as having been constructed in his time to show that in the earliest days of science visual aids were had recourse to, to convey notions of the movements of the heavenly

bodies; and rude and imperfect as those models must have been, they served better than any oral description could have done, to impart a knowledge of the solar system as it was then supposed to exist. Dr. Whewell, at the same time that he advocated the use of such material aids to knowledge, expressed a caution against trusting too much to them; for though the apparatus should be made as perfect as possible, it should always be remembered that the object of such aids is to teach men to think, and not to supersede thought. As an illustration of the advantage to be gained by tangible representations, Dr. Whewell showed, by the different foldings of a sheet of paper, demonstrations of two or three of the definitions and axioms of Euclid, to which objections have been taken, as being neither clear nor self-evident. The definition of a straight line, as "that which lieth evenly between its points," and the axiom that two straight lines cannot enclose a space, though objected to as unsatisfactory when stated in words, become self-evident when shown by creasing a sheet of paper, and by folding its parallel sides together. The doubling of a straight strip of paper into a knot exemplified also demonstratively the formation of a pentagon of equal sides and angles. The mechanical problem, that the fall of a body down an inclined plane is proportional to the length of the plane, was also exemplified in a simple and novel manner by the suspension and equipoise of a chain over an inclined plane. With respect to the third proposition, that one object of education should be to give an appreciation of the beautiful, there might be some question; but he considered that a love of what is beautiful in form and colour, of what is elevated in thought and language, and of what is harmonious in sound, is eminently calculated to raise the character and feelings of men, and to render them more human, and therefore more humane. He thought it of great importance to the improvement of the human race that even the humblest and the poorest should be surrounded by, or at least have frequent opportunities of seeing, what is lovely and beautiful; and the teaching of music he considered to be scarcely inferior to any of the other branches of popular education as a means of softening and elevating the character. As to the fourth, and what may perhaps be considered the most important object of education—that of teaching men how to be good—Dr. Whewell regretted there was so little agreement as to the mode by which it could be best attained. There could not, therefore, be collected any aids to education of this kind; but it might be confidently asserted, that mental education, properly directed, could not fail to produce beneficial effects. Moral and religious training must always go hand in hand with intellectual culture; for by teaching man the exercise of his rational faculties, by making him participate in and appreciate what is true and beautiful, they would not fail to make him good.

## YOUNG'S PARAFFINE PATENT.—LAW CASE.

### YOUNG *v.* WHITE AND OTHERS.

*Tried before Lord Campbell and a Special Jury at Westminster, 28th and 29th June last.*

THIS was an action for the infringement of a patent granted to James Young, the plaintiff, 17th October, 1850, for an invention intituled, "Improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom."

The invention consisted of a mode of obtaining an oil called, "paraffine oil," from bituminous coal, and for which the plaintiff received a medal at the Great Exhibition.

The mode adopted by the plaintiff was to distil the coal at a low red heat, and by this means the conversion of the elements of the oil into gas and napthaline is avoided, and the product of the distillation is a valuable oil, rich in the element called paraffine, which is then purified, and in that state is peculiarly valuable for lubricating the joints of machinery and other rubbing surfaces, paraffine being an extremely slippery substance.

The defendants carry on business at Manchester as the Hydro Carbon Gas Company, and are interested in two patents granted to the defendant White, one 15th April, 1847, the other 26th March, 1849, for inventions relating to the manufacture of gas.

Under the first of these patents the defendants made a compound gas from the vapours of oil, fat, and tar, and hydrogen obtained by the decomposition of water. In the specification of the defendant's second patent, he described the use of resin, tar, or fat for similar purposes as mentioned in his former specification, and also stated that pit-coal might be used; but in that case raising the temperature used to "a white red-heat."

The plaintiff called many scientific witnesses to prove the novelty of his invention, and others to show that the defendants had infringed by a colorable use of the defendant White's invention, comprised in his second patent; and evidence was given of the sale by the defendants of an oil, which they called paraffine oil, and which, upon being analysed by the plaintiff's chemists, was found to contain paraffine.

The defence was, that the plaintiff's patent was void, on the ground that the invention was not new, and that the defendants had not infringed, the oil being a product obtained in the manufacture of their gas.

To prove the want of novelty, the defendants read in evidence extracts from several chemical works, the principal of which were Sir Robert Kane's "Chemistry," and some books in the German language, sold in this country.

These extracts seemed to show that scientific chemists were aware that *paraffine* (discovered by Liebeg) could be obtained from several substances, including wood, tar, and coal; but they spoke of the production of napthaline at the same time, and the paraffine had only been produced in very minute quantities. It was also proved that the effect of using the heat necessary for producing napthaline in the distillation of bituminous coal, is to destroy or prevent the formation of paraffine, which is, by the plaintiff's process, obtained free from napthaline.

The defendants also called scientific chemists, who stated that in their opinion there was nothing new in the invention.

The defendants also called witnesses to prove that paraffine may be obtained from common gas tar, but it appeared that the quantities so obtained were minute, and not free from napthaline.

The Lord Chief Justice directed the jury, that if they were of opinion that the books given in evidence disclosed the plaintiff's invention to the public before the date of his patent in such a way that it could be successfully used or practised, the invention could not be new, and the patent would be void; and that if the defendants had made a mere colorable alteration in their process for the purpose of enabling them to use the plaintiff's invention, they were guilty of an infringement.

The Jury found a verdict for the plaintiff on each of the questions raised between the parties.

The trial of this case was very long, and was not concluded until a late hour on the second day, but the above condensed statement is sufficient to convey a correct idea of the effect of the trial.

The Attorney-General, Mr. Bramwell, Mr. Hindmarch, and Mr. Willis were counsel for the plaintiff, and Mr. H. Hill, Mr. Grove, and Mr. Webster for the defendants.

## IMPROVEMENT IN CAR-WHEELS.

The annexed engraving represents an improvement in cast-iron railroad car-wheels, for which a patent was granted to George W. Glass, of Allegheny City, Pa., on the 25th of last April.

Figure 1 is a top view of the wheel, and

Fig. 1. Fig. 2.

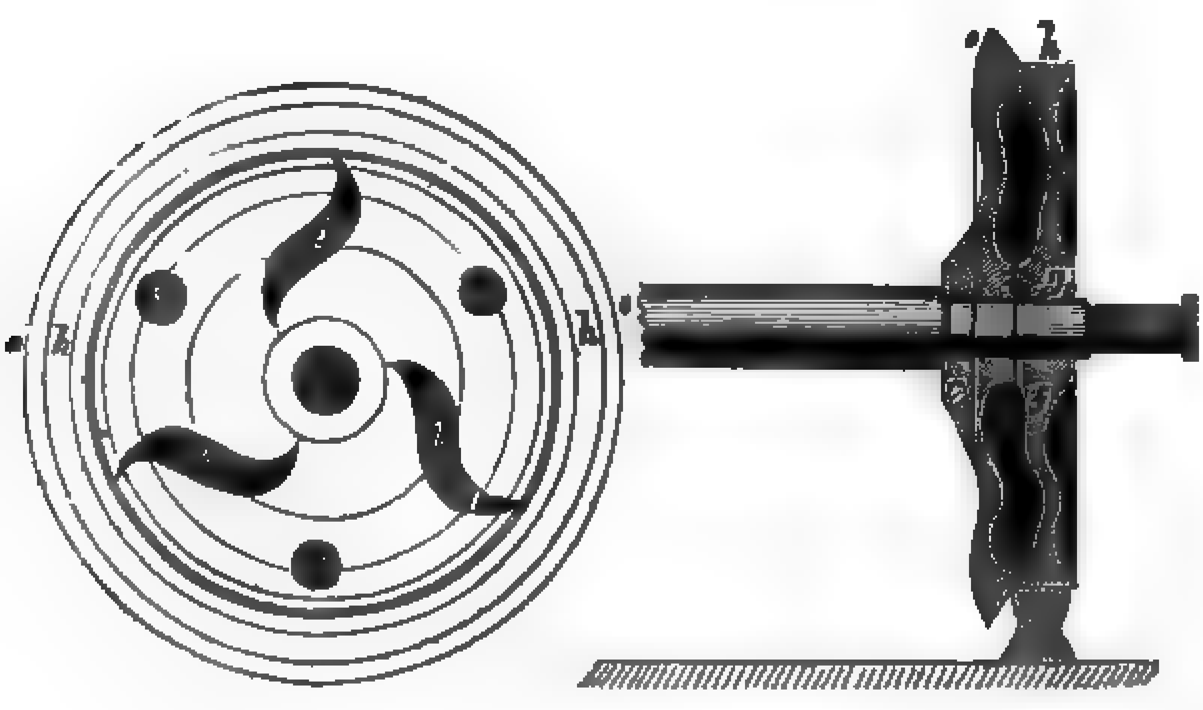



fig. 2 is a transverse vertical section of a wheel secured on the axle, G. The same letters refer to like parts.

The wheel has two discs or sides, *e* and *f*. The space between them is connected by the hub, the rim, and the flange. All the

several parts of the wheel are cast in one piece. The wheel is dished inwards, the inner face of the hub, *g*, projecting beyond the plane of the flange, *o*. In casting the wheel, the core holes, *n n n*, are left in one or both sides. The inner disk, *e*, of the wheel is of a uniform thickness throughout, and of the form represented. The disk or side, *f*, is also of a uniform thickness throughout, and of the form represented; it is not dished, however; its general bearing is perpendicular to the axis of the wheel. Its shape is a strongly waved line, with one semicircular convex projection near the rim, and with a corresponding projection near the hub. The two sides, *e f*, are united to the rim and to the hub, by an arch, and there is no angle formed at these points of union. These arches are continuous around the rim and the hub, and tend to make the wheel strong. In each of the disks or sides are braces, *i i i*, which are projections outwards, and cast with the wheel; they are of the same thickness as the disks. The braces are placed between the hub and the rim at equal distances apart, and may be three or more in number. The object of these braces is not so much to allow for the contraction of the metal of the sides in cooling (which, however, is necessary), as to give additional strength to the wheel without adding materially to its weight. These braces may be used on one or both sides of the wheel, and a different form of them from that represented may be used on different disks. The claim is for the construction of cast-iron railroad car-wheels, having their two sides united at the tread and hub inside by semicircular or elliptical arches, in combination with the braces represented.

Mr. Glass is master machinist in the machine shop of the Ohio and Pennsylvania Railroad Co., at Allegheny City, and he informs us that his wheels have been used on that road under both passenger and freight cars for about eleven months—250 of them being now in use—and that "since the first was put on an axle, *not one* has given out, broken, or shown any sign of a defect." This is strong testimony in favour of the qualities of this wheel.—*Scientific American.*

## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

Certain corrections which should have been made in the proof of the valuable letter of our correspondent, "A Mechanic," on the above subject, published in our last number, were accidentally neglected. As the letter is very important, we think it better to specially direct the attention of our readers to the omission than to suggest them in a list of *errata* merely. In the 30th line from the top of the first column, page 37, $v$ should have been V; and wherever the term $v \cos \theta$ occurs in the remainder of the letter, it should have been V cos. $\theta$. Although the nature of the error has doubtless been discovered by those of our readers who are familiar with analytical investigation, it is calculated to confuse others who are not.

*Elements of Geometry and Mensuration, with Easy Exercises, designed for Schools and Adult Classes. Part I.—Geometry as a Science.* By Thomas Lund, B.D., Rector of Morton, Derbyshire; Editor of "Wood's Algebra." Formerly Fellow and Sadlerian Lecturer of St. John's College, Cambridge.

The study of geometry presents itself under different aspects according to the objects proposed. If intended chiefly as an instrument of mental discipline, as in some measure a substitute for logic, or, at all events, as supplying the best and most complete set of examples of the science of abstract ratiocination, geometry cannot perhaps be better exhibited than it is in Euclid's Elements, where, from a few definitions and axioms embodying the most elementary notions we can form of the subject, the student is led step by step by a strict process of deduction to the most recondite propositions. By this process the mind is accustomed to look carefully to the various links by which one truth is connected with another, to reject all that is false and inconsequent, and to adopt none but strictly correct methods of investigation.

The habit of mind thus formed is invaluable; nor is it easy to discover how otherwise it could be so readily or efficiently built up; and, which is a most important consideration, the study of geometry can be commenced, and its fruits partly reaped at a much earlier period of life than the abtruse and somewhat dry rules of logic can be advantageously instilled. Teaching by example, which is most suited to youthful minds, is, *par excellence*, the characteristic of geometry, considered as an instrument of mental discipline.

In this view the fewer and simpler the elementary notions on which the science is founded the better: nothing should be accepted as self-evident truth which may by any possibility be derived from other and more simple truths. The *time* which is necessarily consumed on the acquisition of the science in this way is a comparatively small object, because we have supposed the student to be at an early age, when his

faculties could not possibly be sufficiently mature to grasp the principles of a more advanced science. Time, therefore, is far from being lost, though many months be consumed in obtaining a tolerably correct knowledge, even of the First Book of Euclid's Elements. And, as it was before hinted, it would be impossible perhaps to reduce the *necessary* elementary notions of geometry to fewer heads than in Euclid's Elements; while the logical processes by which the propositions are deduced from his definitions and axioms are faultless. Nor, again, if we view the elements of geometry as a portion of mathematical truth, and introductory to the higher walks of pure science, as forming, in fact, the first foundation of the building on which the mathematician is to be erected, could we with advantage improve upon Euclid's Elements.

To the development of mathematical power many and varied examples and illustrations of principles are requisite. Instead of curtailing the number of propositions in elementary geometry, the student who is desirous of becoming a mathematician must ever be on the look out for fresh deductions from the principles of his science, on the solution of which, though perhaps in themselves of little value otherwise, he may exercise his awakening faculties. And we venture to say, that nothing can supply the want of a thorough geometrical training by means of a varied and extensive course of deductions. An accuracy, quickness, and definiteness of perception, and a practical habit of interpretation of his results, are thus attained, which are of the utmost value to the mathematician.

There is, however, a class of persons, and that a continually increasing class, to whom neither the strict logical method of Euclid, as an instrument of mental discipline, nor the extensiveness and variety of his propositions as the instrument for forming the complete mathematician, are of so much importance. I mean those who, with little previous training, and at a later period of life, are desirous of acquiring a certain amount of sound geometrical information as necessary to the perception of the principles of the art which their calling requires them to practise. The practical tendency of the English mind has for a long series of years reduced the skilled labourer in the various branches of our industrial arts to a mere machine; performing the mechanical part of his work well enough, but utterly unacquainted with the principles on which his art is founded. In many of the continental states, on the contrary, speculative as well as practical knowledge of his trade has been encouraged amongst artizans; the results of which were conspicuous in the superior workmanship and ingenuity, and, above all, in the more correct taste displayed by foreign artizans, as compared with our own, at the Great Exhibition of 1851. The inferiority shown by Englishmen on that occasion in many departments of the arts has given an impulse to a movement, then already begun, for the better education of our artizans; and hence has arisen the necessity of considering whether mastering the elements of geometry in the form and to the degree they are exhibited in Euclid is essential; whether, in fact, the time (which to such persons is an element of the highest importance), which is consumed on this study, might not be economized and laid out to greater advantage, by adopting a somewhat different method. Another practical question, too, is whether the study of geometry could not be, in some measure, divested of the dry, repulsive character which it now presents to the student of more mature years.

All who have had any experience in conducting what we may call schools of applied science, intended for the artizan class, are well aware of the repugnance to Euclid to which we allude; and it is moreover a matter of universal experience, that the very limited time which is available for the purposes of scientific instruction is barely sufficient (except in a few rare instances of superior ability) to carry the student fairly through the three First Books of Euclid. He is, therefore, brought only as far as the threshold; he has been permitted scarcely to peep within the doors of the building into which he ought to have been conducted, if any practical good is to result from his education.

Further still, should he, by dint of application and superior intelligence, obtain some knowledge of the Sixth Book of Euclid, it is very doubtful whether he obtains much benefit; as it is not too much to assert, that the very definition of proportion which Euclid makes the basis of his reasoning in the fifth and sixth books is unintelligible, or at least very indistinctly grasped, until the mind has been matured, and acquired other ideas on the same subject in other more advanced branches of the mathematics.

Nor must another, and that, in our opinion, the most essential consideration, be omitted. In all departments of practical art the artizan has to deal with problems of *three*, not of *two dimensions*. He has to construct objects having *length*, *breadth*, and *thickness*, and not figures in one plane, having *length* and *breadth* alone. But of course the draughtsman must represent all his objects upon one plane only, by means of plans or projections upon two or more planes; and from these draughts the true conception of the object in question has to be obtained, and its true form, size, and dimensions constructed.

Now to effect this is the object of Descriptive Geometry and its several applications. It would seem therefore that little has been effected towards the professional education of the artizan, until he has been introduced to at least the most prominent propositions of Descriptive Geometry. Viewed moreover as an instrument of education, Descriptive Geometry calls into play higher faculties than Plane Geometry can do. In the latter, when the proposition is stated, the whole of the construction necessary to the statement can be made on paper, and the student is only required to tax ingenuity to discover the middle terms for the connection of the data with the conclusion; in the former, however, he has, in addition, to form a conception in his own mind of the data themselves. It cannot therefore be disputed, that powers of a higher order are required for the acquisition of the knowledge of problems in solid geometry; and these powers require to be exercised and brought into vigorous play, in order to the due education of the skilled artizan. Hence the importance of including some portion at least of the elements of Descriptive Geometry in such a course.

For all these reasons combined, it seems impossible to escape the conclusion, that for classes of adult artificers, or for youths of small previous training, to whom it is thought advisable to extend the advantages of a professional education, a modified course of geometry is more suitable than that contained in Euclid's Elements.

The modifications should have the following objects in view :—1. Inclusion among elementary self-evident notions a considerable class of propositions which admit of proof, but which the student has no difficulty in accepting without. As a single instance, we would include among these notions the method of drawing from a given point a straight line equal to a given straight line, and of cutting off from the greater of two straight lines a part equal to the less; that two circles can cut each other in no more than two points, and the like. On a little reflection it will be seen, that this will reduce the number of necessary propositions very materially.

2. Condensation of existing propositions, so that from one general proposition several deductions now stated as distinct propositions may be deduced, and thus unnecessary repetition avoided.

3. Omitting a considerable number of propositions which are of use in higher mathematics, but have not an immediate bearing on the principles of solid geometry, the end which should be kept steadily in view for the classes we have indicated.

4. Re-arrangement, and illustration where necessary. By such means a course of plane geometry, sufficiently extensive, but not unnecessarily so, might be devised, which might be acquired in less than half the time that is consumed in learning Four Books of Euclid's Elements, and thus leave a sufficient time to the student to form some acquaintance at least with the principles of Descriptive Geometry and its application to the art practised by the learner.

Such, to a considerable extent, appear to be the objects of the little book which we are called upon to review. The author states his object in these words: "I have thought that good service might be rendered to the cause of popular education by framing a work which shall neither terrify by its size, nor repel, as Euclid does, by a studied avoidance of all practical illustration." We believe that Mr. Lund has, to a very great degree, succeeded in the object he has proposed to himself, and we have therefore pleasure in recommending his little work to the classes for whom it is intended. At the same time, we think the subject capable of still further simplification, and we believe that it is not improbable that a short practical Course of Geometry, both Plane and Solid, combined with the elements of Descriptive Geometry, suitable to the operative class, may issue from the press before many months have elapsed.

While we give Mr. Lund every credit for his very successful effort to simplify the elements of plane geometry, we must, as impartial critics, notice an imperfection. The author professes to preserve in his proof, except in a single instanee (which he does not specify), the *strictness* of the ancient geometers. Now he proves Euclid's fourth proposition of the First Book in the usual way, and then attempts to deduce the eighth proposition from it as a corollary. Against this we enter our protest, for the one of these propositions requires proof just as much as the other. No doubt the author has been repelled from the attempt to do this by the necessity, on the plan which he follows, of establishing first Euclid's seventh proposition. By another mode of treating this whole subject of equality of triangles under certain conditions, this difficulty might have been avoided, and a logical proof given of the eighth as well as of the fourth proposition. We agree very much with Mr. Lund's mode of treating the subject of proportional straight lines, &c.; and in conclusion we repeat what we have before said, that it is a very successful attempt, on the whole, to bring the science of geometry within the reach of a large class who would never think of studying Euclid's Elements.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

BENNOCH, FRANCIS, of Wood-street, Cheapside, London. *Improvements in coating silk and other yarn or thread with gold or other metal.* (A communication.) Patent dated December 23, 1853. (No. 2985.)

This invention consists in coating silk and other threads with gold, silver, or other metal leaf, by first covering a cylinder or roller with the leaf, then winding thereon the silk or thread which is to be coated, and in then laying metal leaf on the surfaces of the silk or thread, and pressing it with dry cotton.

PFEIFFER, JEAN DANIEL, of Paris, France, gentleman. *Improvements in machinery or apparatus for cutting paper and similar materials.* Patent dated December 23, 1853. (No. 2986.)

This invention consists in constructing machinery for cutting the concave and flat edges of books and registers, by means of which the edges of several books may be cut at one operation, a circular knife being employed in forming the concave edges.

GAULTIER, JOSEPH, of Paris, France, gentleman. *An improved apparatus for washing and bleaching.* Patent dated December 24, 1853. (No. 2988.)

*Claim.*—The construction of an apparatus consisting of an open cylinder divided into open cells and playing in a tub or other vessel.

HARDINGE, HARRIS, of New York, United States. *Manufacturing liquid quartz or silex, to be used in the manufacture of certain compositions for ornamental and useful purposes.* Patent dated December 24, 1853. (No. 2991.)

*Claims.*—1. The introduction of steam under pressure into the pulverized agitated mass, thereby lessening the quantity of boracic acid or other solvents heretofore used, thus saving the cost and rendering the liquid quartz so formed sufficiently cheap to be useful. 2. Condensing the steam or vapour produced in the process, so as to save the particles of liquid quartz that are carried off with the steam in the form of capsules. 3. The introduction of liquid quartz, made by the above process, into various compositions.

BUCHHOLZ, GUSTAV ADOLPH, of Gould-square, Crutched-friars, London, civil engineer. *Improved machinery for the cleaning and hulling or dressing of rice, wheat, and other grain.* Patent dated December 24, 1853. (No. 2992.)

The inventor mounts on a vertical axle a conical stone, provided with a thread or worm, and surrounded with a stone or other suitable casing, so that a gradually contracting space is left between the two for the reception of the seed or grain, with which pebbles are combined in order to carry it down and facilitate the process.

LEWIS, JOSEPH, of Salford, Lancaster, machinist. *Improvements in apparatus for drilling or boring metals and other substances.* Patent dated December 24, 1853. (No. 2993.)

This invention relates to hand-drilling apparatus, in which the feed is regulated by a screw-nut, to be governed in its rotation by the workman, and consists mainly in the adaptation to the said nut of suitable mechanical apparatus for holding it by friction, the amount thereof being capable of adjustment, so as to regulate the feed.

MAKIN, THOMAS WILLIAMS, of Manchester, Lancaster, silk finisher. *Improvements in machinery or apparatus for finishing woven fabrics.* Patent dated December 27, 1853. (No. 2995.)

This invention mainly consists in obtaining any required amount of pressure on the centre bowl or cylinder of the machine by means of a weighted carriage and regulating screws.

HUGHES, EDWARD JOSEPH, of Manchester, Lancaster. *Improvements in sewing machines.* (A communication.) Patent dated December 27, 1853. (No. 2996.)

*Claims.*—1. An improved construction of needles. 2. Certain means of obtaining a cam motion from the fly-wheel, for the purpose of working two vertical needles. 3. A method of using two vertical needles to make a similar stitch to that made by hand, with improved thread-guides and feed motion. 4. A method of sewing with one thread and one needle, producing a back stitch of various forms, similar to those made by hand. 5. A feeding motion by a notched chain. 6. A method of using two needles and two thread guides, or one needle and one thread guide.

CALVERT, FREDERICK CRACE, of Manchester, Lancaster, professor of chemistry. *Improvements in the treatment of naphtha and other volatile hydro-carbons, and in the application of the same to various useful purposes.* (A communication.) Patent dated December 27, 1853. (No. 2997.)

The patentee claims the application of purified coal, naphtha, or nearly pure Benzine, to the removal of spots or stains of fats, oils, waxes, paints, tars, or resins, from cotton, woollen, silk, and other fabrics,—to the cleansing of hair, fur, feathers, wool, and gloves,—to the preparation of spent cotton-waste, and to the manufacture of furniture paste.

SEDGWICK, SAMUEL, and THOMAS DAWSON, of Piccadilly. *Improvements in the moderator lamp, or in lamps of a similar principle.* Patent dated Dec. 27, 1853. (No 2999.)

This invention mainly consists in the use of a cylinder of perforated metal, which is fitted within the outer ornamental shaft or gallery that supports the glass holder, the object being to increase and regulate the supply of air for the combustion of the oil.

PRIDEAUX, THOMAS SYMES, of St. John's Wood, Middlesex. *Improvements in apparatus for regulating the supply of air to furnaces, and for preventing radiation of heat from fire-doors and other parts of the fronts of furnaces.* Patent dated December 27, 1853. (No. 3000.)

A full description of this invention was given in page 273, vol. lx.

PARKINSON, JOHN, of Bury, Lancaster, brass-founder. *Improvements in governors for regulating the pressure of steam, gas, and other fluids or liquids.* Patent dated December 28, 1853. (No. 3002.)

This invention consists—1. In the application of a double compensating valve acted upon by a flexible diaphragm or other equivalent agent, for regulating the pressure of gas, &c. 2. In an improved combination of parts for regulating the pressure of steam, &c., consisting of a double compensating valve and flexible diaphragm, the latter being protected from the action of the steam by a column of water or other liquid.

TAYLOR, JAMES, of the Britannia Works, Birkenhead, Chester, engineer. *Certain improvements in raising and lowering weights.* Patent dated December 28, 1853. (No. 3004.)

This invention consists in combining a pair of engines coupled together with the ordinary crab, winch, or other suitable mechanical agent.

GREEN, RICHARD, of the firm of Davis, Greathead and Green, of the Flint-glass Works, Brettell-lane, Stafford. *Improvements in insulators for insulating the wires or rods employed for conducting or transmitting electricity.* Patent dated December 28, 1853. (No. 3007.)

*Claim.*—The forming of insulators entirely of glass or porcelain, and with a screw of the same material for connecting it to a post, or to any other object to which it is to be fixed.

MACINTOSH, JOHN, of Pall-mall East, Middlesex. *An improvement in discharging projectiles.* Patent dated December 28, 1853. (No. 3008.)

This invention consists in causing the tube or barrel of a fire-arm to rotate when firing, by which means the ball or projectile is to receive a rotatory motion at the time of its projection.

BARNES, JOHN, of Church, Lancaster, manufacturing chemist. *A certain improvement or improvements in dyeing and cleansing cotton, silk, wool, and other fabrics.* Patent dated December 28, 1853. (No. 3009.)

To muriatic acid the inventor adds as much bone as it will take (always keeping the latter a little in excess), by which the acid will be neutralized in from two to four days. There will then be a quantity of fatty matter upon its surface, much similar to yeast, or barm, which he skims off and treats, to prepare it for the purposes enumerated in the title.

PARKER, FRANCIS, of Northampton. *An improvement in the manufacture of gaiters.* Patent dated December 28, 1853. (No. 3010.)

This invention consists in manufacturing gaiters of two fabrics, cemented together by India-rubber cement, parallel strands of vulcanized India-rubber, held in an extended state, being introduced between.

M'NEE, DUNCAN, printer, of Hillfield, Kirkintillock, Dumbarton, and ALEXANDER BROADFOOT, merchant, of Ingram-street, Glasgow, Lanarkshire. *Improvements in printing with colours on cloth, which are also applicable to printing ornamental designs on paper or other surfaces.* Patent dated December 28, 1853. (No. 3012.)

This invention relates principally to the printing of handkerchiefs, shawls, plaids, and similar articles by means of a machine patented by Mr. M'Nee December 3, 1852.

JACKSON, HENRY, of High-street, Poplar, Middlesex. *Improvements in machinery for moulding bricks and other articles of brick-earth.* Patent dated December 29, 1853. (No. 3014.)

In carrying out this invention the earth is taken from pug-mills on to an incline, and pressed forward by rollers furnished with blades, which move it forward on to a series of endless straps of gutta percha, or other suitable material, which also carry it forward in divided sheets between guides. On these arriving over a table or platform, cutting-moulds descend, and each mould cuts out a quantity of earth suitable for a brick or other article, and this is then pressed into the mould by a piston or plunger operated by a spring, which, when the mould rises, forces out the moulded articles.

PHILLIPS, MARY, of Birmingham, Warwick, widow. *Improvement or improvements in metallic revolving or winding shutters.* (A communication from her late husband.) Patent dated December 29, 1853. (No. 3016.)

This invention consists in connecting or jointing together the metallic strips or laths of which metallic revolving shutters are composed, by bending their edges into a cylindrical or nearly cylindrical form, and causing the bent edges to slide upon or

engage in one another, either with or without a central axis.

Rémond Amédée François, of Birmingham, Warwick, gentleman. *New or improved metallic tubes.* Patent dated December 29, 1853. (No. 3017.)

*Claim.*—Making metallic tubes having corrugations in planes perpendicular to their axes.

White, James, of East-street, Red-lion-square, Middlesex, engineer. *Improvements in friction-joints or fastenings.* Patent dated December 29, 1853. (No. 3018.)

This invention is applicable to the joints of telescope-stands, the joints of compasses, calipers, toilet-glasses, &c., and consists simply in forming the joint hollow, and filling the space with a packing of cork, which is caused to bear tightly against the metal surfaces of contact.

Crossley, James William, of Brighouse, Halifax, York, dyer and stuff-finisher. *Improvements in the production of surface-finish to certain descriptions of fabrics composed of worsted, cotton, or silk, or combinations thereof.* Patent dated December 29, 1853. (No. 3019.)

*Claim.*—The producing on *both* sides of certain fabrics the "surface-finish commonly called 'watering,' and also 'moiré antique.'"

Roux, Claude Alphonse, of Belleville, near Paris, France. *Improvements in printing warps of cut pile and similar fabrics.* Patent dated December 29, 1853. (No. 3020.)

*Claims.*—1. Printing warp for cut pile and similar fabrics by means of hollow parallelopipeds or tubes, closed at the bottom with felt or other suitable material, these tubes being filled with the colours required, and put together or composed so as to form the design, an impression of which is produced by pistons acting simultaneously on the colours in the tubes. 2. Applying the Jacquard machine to printing warp for cut pile and similar fabrics. 3. Printing warp for cut pile and similar fabrics, by means of colour-troughs and perforated parallelopipeds or pistons.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the manufacture of screws.* (A communication.) Patent dated December 29, 1853. (No. 3022.)

These improvements in the manufacture of wood screws involve a series of processes which are performed wholly or mainly by automatic machinery, the blanks being formed from a coil of annealed wire of suitable diameter, received in a machine, and cut into pieces of the proper length to form the required screw, in such manner as to have one of its ends enlarged by compression to form the head.

Pickstone, William, of Radcliffe, Lancaster, manufacturer, and John Booth, of Pilkington, Lancaster, manager. *Improvements in looms for weaving.* Patent dated December 30, 1853. (No. 3023.)

This invention consists—1. In using a chain provided with tappets "for governing the action of the picking motion, whereby we are enabled to work 'pick-and-pick,' or several picks following from one side, according to the pattern required. 2. In a particular description of cam for producing the same effect. 3. In a method of causing the ordinary 'pick-and-pick' motion to take place in looms which have a rising box at either side."

Ruolz, Henri Catherine Camille de, and Anselme de Fontenay, both of Paris, France, civil engineers. *An improved metallic alloy.* Patent dated December 30, 1853. (No. 3026.)

This invention consists in the production of an alloy composed of silver, copper, and nickel in any proportions, having the appearance of real silver.

Marlor, James, of Oldham, Lancaster, coal-agent. *Certain improvements in ascending and descending mines and shafts, and in the apparatus connected therewith, by which said improvements the ventilation of mines is increased.* Patent dated December 30, 1853. (No. 3027.)

The inventor places in the mine tubes extending from the top to the bottom, and in these tubes he places cages formed in the ordinary manner, except that in the crown of each of them there are two or more valves opening inwards, and at the edges or sides of the crown a number of lateral valves, so fixed that they may be pressed outwards and against the inner sides of the tube by the pressure of the air contained in the tube during the descent of the cage, the two valves in the crown being forced upwards and closed by a similar pressure.

Mahon, Walter, of Ardwick Ironworks, Manchester, Lancaster, engineer. *Improvements in machines used for riveting together metallic plates.* Patent dated December 30, 1853. (No. 3028.)

This invention mainly consists in an arrangement for machines of ordinary action, wherein the riveting ram is actuated directly from an eccentric or cam; and a method in which, by the use of a buffer or other powerful spring, the ram or die for riveting is made to give way after a certain fixed pressure has been put upon the rivet.

Milner, John, of Stratford, Essex, engineer. *Improvements in connecting the rails of railways.* Patent dated December 31, 1853. (No. 3030.)

*Claim.*—Connecting the different lengths

of the rails of railways by means of one or more pins or dowels inserted into holes drilled in the ends of them.

Physick, Henry Vernon, of Northbank, Regent's-park. *Improvements in electric telegraphs and apparatus connected therewith.* Patent dated December 31, 1853. (No. 3031.)

This invention mainly consists in an arrangement of bearings, the fitting of which will not be affected by the warping of the wood on which they rest,—in the use of a material which lessens the amount of noise consequent on working the instrument,—and in the use of certain springs, and an arrangement for reversing the current.

Pym, John, of Pimlico, Middlesex, gentleman. *Improvements in machinery for grinding auriferous and other ores, and separating the metal therefrom.* Patent dated December 31, 1853. (No. 3033.)

A full description of this invention will shortly be given.

Tuxford, Weston, of Boston, Lincoln. *Improvements in portable thrashing-machines, part of which improvements is also applicable to fixed thrashing-machines.* Patent dated December 31, 1853. (No. 3034.)

The improved machine has a feeding apparatus combined with the drum, consisting of an endless web, working on rollers, with an additional roller in front next to the drum (this part will fold up when the machine is travelling),—a drum and screen of the usual construction,—an inclined straw-shaker, with wired, perforated, corrugated, ribbed, or lathed bottom, and a circular revolving rake for lighting up and thinning the contents of the shaker, riddles, and winnowing apparatus, &c.

Trueman, Alfred, of Swansea, and Isham Baggs, of London. *Improvements in grinding, amalgamating, and washing quartz and other matters containing gold.* Patent dated Dec. 31, 1853. (No. 3035.)

This invention consists in constructing a machine composed of a heavy spherical crusher, placed within a trough or vessel mounted on horizontal hollow axes. The mercury is to be placed in the trough with the quartz.

Holbrey, Joseph, of Bradford, York, wool sorter. *Improved machinery for combing wool and other fibrous materials.* Patent dated December 31, 1853. (No. 3037.)

In carrying out this invention, gill fallers are connected together by endless bands or chains, which pass over supporting rollers or guides and bring the gills or combs forward, for the purpose of taking up the wool or other fibrous material from the feeding-head and transferring it to the travelling combs, from which it is stripped off by any ordinary contrivance.

Slater, James, of Salford, Lancaster, mechanic. *Certain improvements in cocks, taps, or valves.* Patent dated December 31, 1853. (No. 3038.)

This invention consists in the adaptation or construction of a chamber situated before the entrance to the valve in cocks, taps, or valves, such chamber being larger in diameter than the bore of the valve; and in the use of an eccentric or crank for opening and closing valves, together with a worm and wheel or quadrant.

Bernard, Julian, of Regent-street, Middlesex, gentleman. *Improvements in stitching and ornamenting various materials, and in machinery connected therewith.* Patent dated December 31, 1853. (No. 3039.)

This invention relates to certain methods of forming stitches; to a peculiar arrangement of mechanism for "hemming" or securing the edges of materials; and to placing or securing on one common bed-plate two or more sets of mechanism, each having independent needle mechanism for sewing or stitching.

Oppenheimer, Adolphus, of Manchester, Lancaster, manufacturer. *Certain improvements in the manufacture of silk velvet and other such piled goods or fabrics.* Patent dated December 31, 1853. (No. 3041.)

This invention consists in manufacturing velvets with a silk pile woven as weft, and in such a manner that the pile may be cut the length way of the piece when woven.

Clerville, François Aristide, of Paris, France. *An improvement in the construction of fire-arms.* Patent dated December 31, 1853. (No. 3044.)

This invention consists in a peculiar arrangement of fly-breech for charging guns and pistols, and in mechanical contrivances for strengthening and fixing the same to the stock.

Sorel, Stanislas Tranquile Modeste, of Paris, France, civil engineer. *Certain improved compositions to be employed as substitutes for caoutchouc, gutta percha, and certain fatty bodies.* Patent dated December 31, 1853. (No. 3045.)

The principal bases of these compositions are the following substances:—colophony or common resin, bitumen or natural pitch, or the pitch obtained from gas-works, fixed resin oils, gutta percha, hydrated lime, and water. The above substances are employed (by weight) in about the following proportions:—colophony, 2; pitch or bitumen, 2; resin oil, 8; hydrated lime, 6; gutta percha, 12; water, 3; pipe-clay or other like argillaceous earths, 10.

*** The documents of No. 3024 are with the Law Officers under first reference.

### PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GILLOW, JOHN, junior, of Northwich, Chester, salt proprietor. *Certain improvements in the manufacture of salt.* Application dated December 23, 1853. (No. 2982.)

This invention consists in evaporating brine "by means of steam generated in a boiler, of which the pan containing the brine forms the upper part or cover, such boiler being fitted with any number of fire-boxes, so placed as to be surrounded by water."

COLES, RICHARD GEORGE, of Cheltenham, Gloucester, Lieutenant Regiment of Foot. *Improvements in the locks of fire-arms.* Application dated December 24, 1853. (No. 2987.)

This invention consists in the employment of vulcanized India-rubber, or other suitable elastic material for the main, and (if necessary) other springs used in the locks of fire-arms generally, as a substitute for the steel-springs hitherto employed.

GOUTARET, GEORGE, of Paris, France, gentleman. *A new system of propulsion.* Application dated December 24, 1853. (No. 2989.)

This invention consists in giving motion to sets of flat paddles by means of spiral springs, trundles, crank-shafts, bevel-wheels, moveable cylinders, &c.

MARGERISON, JOSHUA, of Preston, Lancaster, agent. *Improvements in railway breaks.* Application dated December 24, 1853. (No. 2990.)

This invention consists in furnishing the carriages and tender of a railway train with a longitudinal sliding-bar, to which is attached a chain acting upon knee-joint levers, which bring into action a pair of clamp-breaks, which act upon drums fixed on the axles of each carriage.

COOPER, THOMAS, of Leeds, York, bookbinder. *An improvement applicable to the binding of ledgers and other books.* Application dated December 24, 1853. (No. 2994.)

The inventor forms the back of the cover of metal or other rigid substance, and inserts between it and the book a steel spring, attached by one of its ends to the former.

MACKELÇAN, GEORGE JOSIAH, of Lechlade, Gloucester, agricultural - implement maker. *Improvements in winnowing or corn dressing machines.* Application dated December 27, 1853. (No. 2998.)

This invention consists in combining a series of sieves, of varying degrees of fineness, with ordinary winnowing apparatus.

MOLYNEAUX, THOMAS, of Manchester, Lancaster, engineer. *Certain improvements in winding and doubling silk, a part of which improvements is applicable to the treatment of other fibrous substances.* Application dated December 27, 1853. (No. 3001.)

This invention mainly consists in winding raw silk from the cocoon by means of a modification of the machine known as the turning jenny, or mule, without drawing-rollers.

MOFFAT, JOHN, of Heiton, Roxburgh, Scotland, teacher. *Improvements in the means of communication between the guard and the engine-driver in a railway train.* Application dated December 28, 1853. (No. 3003.)

This invention consists in applying tubes arranged telescopically to the carriages, &c., of railway trains.

COATES, WILLIAM UNETT, of Ombersley, Worcester, clerk. *A new or improved rotary steam engine.* Application dated December 28, 1853. (No. 3005.)

We purpose giving an engraving of this engine in a future number.

ALEXIS, JOSEPH, of Avignon, France. *An improved railway break.* Application dated December 28, 1853. (No. 3006.)

In order to bring this break into action, the guard or engine-driver releases a catch which holds back certain short sliding bars, and a spring exerting pressure thereon forces them suddenly outwards and against buffer-heads on the sliding bars of the next carriage, and so on throughout the train.

BARNES, SAMUEL, of Oldham, Lancaster, machine-maker. *A certain improvement or improvements in the construction of looms.* Application dated December 28, 1853. (No. 3011.)

This improvement consists in placing the emery roller, which causes the cloth-beam to revolve, below the cloth-beam.

PHILLIPS, THOMAS, junior, of Sparkbrook, Warwick, gentleman, and SAMUEL PHILLIPS, of Birmingham, same county, gun manufacturer. *Improvements in the construction of window-shutters, which improvements are also applicable as an additional security for doors and other similar openings.* Application dated December 28, 1853. (No. 3013.)

These improvements consist in constructing shutters of laths placed vertically.

ESTIVANT, EDWARD, of Givet, France. *Improvements in the manufacture of tubes of copper and its alloys.* Application dated December 29, 1853. (No. 3015.)

This invention consists in manufacturing brass by a hammering instead of a drawing or rolling process.

VION, HIPPOLYTE CHARLES, of Paris, France. *Improvements in pistons and stuffing-boxes of engines moved by water, steam, or gas.* Application dated December 29, 1853. (No. 3021.)

These improvements "consist in substi-

tuting for the springs, screws, cones, &c., usually employed for tightening, the resilient action of water, ether, or any other suitable liquid, or of any compressed and liquefied gas whatever."

SWIRE, BENJAMIN, of Ashton-under-Lyne, Lancaster, nail manufacturer. *Improvements in machinery or apparatus for making metal tips for shoes or clogs.* Application dated December 30, 1853. (No. 3025.)

This invention consists mainly in the employment of a vibrating lever for bending several pieces of metal at once into the required shapes. The lever is provided with proper bending-tools, which are caused by its vibration to advance towards dies upon which the metal is placed.

HOLROYD, ISAAC, of Sowerby-bridge, York, engine-tenter. *Improvements in apparatus employed in singeing textile fabrics.* Application dated December 31, 1853. (No. 3029.)

These improvements consist in placing the plate used in the process of "singeing" textile fabrics in an opening formed for the purpose, immediately over the "fire-box" of a boiler, leaving an opening through the boiler and above the plate, so as to admit of the fabrics being passed over.

WAYGOOD, RICHARD, of Newington-causeway, Surrey, ironfounder. *Improvements in portable forges.* Application dated December 31, 1853. (No. 3036.)

The inventor states that his object is to construct and arrange the various parts of a forge, so that when taken apart they may be packed in a much smaller space than is usually required.

BROWN, THOMAS, of Manchester, Lancaster, manufacturer, and PETER MAC GREGOR, of the same place, manager. *Certain improvements in power-looms for weaving.* Application dated December 31, 1853. (No. 3040.)

This invention consists in arranging a spindle, with sockets moving upon it, so as to prevent the "plucking" of the selvage of the cloth when any derangement or irregularity of the weft occurs, the same arrangement also acting as a self-acting "temple."

HUNT, BENJAMIN, of Brighton, Sussex, upholsterer. *Improvements in obtaining and applying motive power.* Application dated December 31, 1853. (No. 3042.)

These improvements consist "in the application of the force of gravity to a projected fluid column, such column issuing by gravity alone from a lateral opening in a tank or suitably-formed reservoir in the vessel to be propelled."

SOHNTAG, PIERRE, of Paris, France, tailor. *An improved apparatus for measuring and fitting garments of persons.* Application dated December 31, 1853. (No. 3048.)

This invention consists in constructing an apparatus for measuring the human figure, which adjusts itself to any peculiar conformation.

## PROVISIONAL PROTECTIONS.

*Dated June 19, 1854.*

1333. Joseph Valentin Weber, of Orchard-street, St. Luke's, London, watchmaker. Improvements applicable to chronometers and other mechanism requiring a steady spring power.

*Dated June 21, 1854.*

1355. William Donald and William Higinbotham, power-loom managers for John Ferguson and Co., both of Carlisle, Cumberland. Certain improvements in looms.

1357. Henry Vernon Physick, civil engineer, of North-bank, Regent's-park, London. Electric telegraphs, and apparatus connected therewith.

1359. Oliver Rice Chase, of Cornhill, London, mechanical engineer. Improvements in machinery for manufacturing lozenges, and for other purposes.

1361. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in apparatus for generating and utilizing steam. A communication.

1363. William Stableford, of the Bromsgrove Railway Carriage Works, Worcester, foreman to Messrs. Johnson and Kinder, railway contractors. Improvements in railway breaks.

1365. John Fry Heather, M.A., mathematical master at the Royal Military Academy, Woolwich. Improvements in apparatus for regulating the flow of gas.

*Dated June 22, 1854.*

1367. Thomas Chadwick Yates, of Bolton-le-Moors, Lancaster, cabinet-maker. Improvements in wickets for the game of cricket.

1369. John Marriott Blashfield, of Millwall, Poplar, Middlesex. Improvements in the manufacture of china, pottery, bricks, and other articles manufactured for the most part of clay.

1371. Charles Cowper, of Southampton-buildings, Middlesex. Improvements in machinery for combing cotton, wool, flax, tow, silk waste, and other fibrous substances. A communication.

1373. Ephraim Smith, of Carlisle-street, Middlesex, jeweller and watch-key maker. An improved watch-key.

1375. George Fox Logan, of Glasgow, Lanark, boiler-maker. Improvements in portable winches.

1377. Astley Paston Price, of Margate, Kent, chemist. Improvements in the purification of tin, and in obtaining useful products arising from such purification.

1379. Isaac Farrell, of Dublin, Ireland, architect. Improvements in fireproof flooring and roofing, which improvements are also applicable to the construction of walls and bridges, and other like structures.

*Dated June 23, 1854.*

1382. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in machinery for the manufacture of nails. A communication.

1384. Salomon Dreyfus-Werth and Pierre Meunier, of Sainte Marie-aux-mines (Haut Rhin), France. A new or improved system of applying designs to all kinds of fabrics, and of surfaces of wood, marble, and stone.

1386. Thomas Rudd, of Pimlico, Middlesex, en-

gineer. Improvements in stands for casks or barrels.

1390. William Ellsworth Osborn, of Milton, New York, United States of America. Improvements in breech-loading guns or cannon.

1392. Robert Michael Letchford, of Whitechapel, Middlesex, match-manufacturer. A match-stand and holder for holding matches while being ignited.

*Dated June* 24, 1854.

1394. Thomas Skelton, of Plaistow, Essex, draughtsman. An improvement in or addition to tillers or yokes.

1396. David Lloyd Williams, of Cannon-street, London, gentleman, and John William Neale, of Stepney, Middlesex, engineer. Improvements in furnaces.

1398. Joseph Davies, of Bristol. Improvements in propelling vessels.

1400. John Kenworthy, of Preston, Lancaster, plumber, and Thomas Rigby, of the same place, plumber. Certain improvements in water closets.

1402. John Revell, of Newark, Nottingham. Improvements in horse-hoes.

*Dated June* 26, 1854.

1404. Alexander Bain, of Queen's-row, Camberwell, Surrey, mechanical engineer. Improvements in fire-arms, and the apparatus connected therewith.

1406. James Brown, of Haddington, Scotland, plumber. Improvements in the manufacture of metal spouts or troughs.

1408. Charles Beale, of Leicester, hosier, and John Latchmore, of the same place, hosier. Improvements in the manufacture of knitted shirts.

1410. William Yates, of Mary-street, Bromley, Middlesex. Improvements in furnaces.

*Dated June* 27, 1854.

1412. Andrew Smith, of Princes-street, Middlesex, wire-rope manufacturer. Improvements in the manufacture of certain kinds or descriptions of wire and other ropes and strands.

1416. William Morgan, of Birmingham, Warwick, manufacturer. Improvements in machines for cutting paper, card, and mill-boards, woollens, veneers, and materials used in making paper, parts of which improvements are applicable to other machines where quick and slow motions are used, and where machinery is required to be thrown into and out of gear.

1418. William Coltman, of High-street, Leicester. Improvement in knitting-frames.

*Dated June* 28, 1854.

1420. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the construction of axle-boxes. A communication.

1422. Henry Sutherland Edwards, of Cranbourne-street, Middlesex, gentleman. Improvements in preparing textile fabrics, or materials for the purpose of their better retaining colours applied to them. A communication.

1424. James Morison, of Paisley, Renfrew, machinist. Improvements in the treatment or manufacture of ornamental fabrics.

1426. John Gregory Jones, of Roscommon-street, Liverpool, secretary and accountant to the Liverpool Collegiate Institution. Improvements in apparatus for teaching addition.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1458. Alexander Southwood Stocker, of Hall-street, City-road, Middlesex. Certain improvements appertaining to match-boxes, and in the fitting, stoppering, and covering of tubes and other vessels of glass, porcelain, and other materials. July 4, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July* 11*th*, 1854.)

470. Emile Chappuis. Improved apparatus for the diffusion of light, called illuminators.

482. John Henry Rehè. Improvements in machinery or apparatus for mixing, washing, crushing, bruising, reducing, or comminuting various substances.

521. William Edward Newton. Improved machinery for measuring and folding cloth and other fabrics or manufactured materials. A communication.

524. William Vaughan and John Scattergood. Certain improvements in machinery, apparatus, or implements for weaving.

527. Charles de Bergue. Improvements in apparatus for bearing and buffing purposes.

531. Francis Herbert Wenham. An improved hydraulic machine for registering or indicating the flow or quantity of fluids, and obtaining motive power.

547. Thomas Dunn. Improvements in machinery and apparatus for moving engines and carriages from one line of rails to another, and for turning them.

557. John Aitken. Improvements in obtaining motive power.

560. John Blair. Improvements in beds or couches, and other articles of furniture.

573. William Peace. Improvements in machinery for measuring, indicating, and registering the flow of air, gas, and other liquids, and for governing the speed of steam or other engines.

606. George Hopper. Improvements in pins for railway chairs.

612. Johnson Hands. Improvements in kilns.

623. William Weatherley and William Jordan. Improvements in steam boilers.

633. John Lilley. A new material suitable for spinning, either alone or combined with other fibres, and suitable to the manufacture of pulp, also certain machinery employed in the preparation thereof.

688. James Newman. Improvements in the manufacture of metallic tubes.

846. James Childs. An improvement in subjecting fatty and oily matters, and matters containing oils or fats to pressure.

944. Frederich Ludewig Hahn Danchell. Improvements in obtaining and applying motive power.

1031. Théodore Lemielle. Improved apparatus applicable to the ventilation of mines, buildings, and other places.

1063. Charles William Feuillade Aubusson. An improvement in ferrules.

1106. Thomas Chambers Hine. A new method of applying glass in the ornamentation of chandeliers, and other fittings required for gas, candle, oil, or other artificial light.

1245. George Garbert. Improvements in the construction of buildings.

1249. Andrew Spottiswoode. Improvements in the manufacture of fuel.

1288. John Young. Improvements in locks and latches.

1299. Thomas Wilson and John Hadley. A new or improved method of constructing certain kinds of rolls or cylinders and dies or surfaces.

1300. James Kite. Improvements in machinery and apparatus for expressing moisture from substances.

1303. John Davie Morries Stirling. Improvements in the manufacture of iron. Partly a communication from Leon Talabot.

1318. George James Hinde. A new or improved combination of materials, to be used for the manufacture of pipes or tubes for drains, and for such other purposes as the same is or may be applicable to.

1323. John Rawe the younger. Improvements applicable to stoves, stove-grates, or fire-places for domestic use.

1324. George Holloway. Improvements in sewing and embroidering machines.

1330. George Mears. Improvements in machinery or apparatus for obtaining sound.

1345. Alexander Stephen, junior, and Alexander Pirnie. Certain improvements in the application of materials for and in the arrangement of and method of applying apparatus to be used as templates for ascertaining and marking the proper positions for the rivet and bolt-holes required in the plates, frames, and other pieces or portions of the materials used in the construction or manufacture of iron ships or vessels, boilers, tanks, masts, spars, and other similar articles.

1347. Nathaniel Clayton and Joseph Shuttleworth. Improvements in portable and fixed combined thrashing, shaking and winnowing machines.

1408. Charles Beale and John Latchmore. Improvements in the manufacture of knitted shirts.

1410. William Yates. Improvements in furnaces.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICES OF APPLICATIONS FOR LEAVE TO ENTER DISCLAIMERS.

A petition has been presented to the Attorney-general for leave to enter a disclaimer, or memorandum of alteration of the specification of the invention for which letters patent were granted to Charles Hancock, gentleman, on the 29th day of July, 1848, bearing the title—"Improvements in apparatus and machinery for giving shape and configuration to plastic substances." The parts of the specification which the petitioner desires to disclaim are from the word "firstly" to the word "fourthly," from the word "lastly" to the word "harden" (with the drawings there referred to), and the first, second, third, and sixth claims. [For abstract of this specification see *Mech. Mag.*, vol. 50, page 116.]

A petition has also been presented by William Seed, of Preston, Lancashire, machine-maker, for leave to disclaim a portion of the specification of his patent for "Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton, and other fibrous substances," dated July 14, 1846.

## NOTICES OF APPLICATIONS FOR PROLONGATION OF PATENTS.

A petition will be presented to Her Majesty in Council by Edward Foard, late of Queen's Head-lane, Islington, in the county of Middlesex, now of 39, Nicholas-street, Hoxton, in the said county, machinist, praying Her Majesty to grant a prolongation of the several letters patent granted to him for England, dated 16th January, 1841; for Scotland dated 16th July, 1841; and for Ireland dated 28th August, 1841; for "An improved method or improved methods of supplying fuel to the fireplaces or grates of steam-engine boilers, brewers' coppers, and other furnaces, as well also to the fireplaces employed in domestic purposes, and generally to the supplying of fuel to furnaces or fireplaces in such a manner as to consume the smoke generally produced in such furnaces or fireplaces." On the 14th August (or on the next day of sitting of the Judicial Committee of Her Majesty's Privy Council, if it do not sit on the day mentioned), an application will be made to that Committee to fix an early day for the hearing of the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council-office on or before that date.

A petition will also be presented by Edward Godson, of Aldersgate-street, in the City of London, ironmonger, as assignee of the above-mentioned several letters patent granted to Edward Foard, for a prolongation of their several terms; and on the 16th August (or on the next day of sitting of the Judicial Committee of Her Majesty's Privy Council, if it do not sit on the day mentioned), an application will be made to that Committee to fix an early day for the hearing of the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council-office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed July* 7, 1854.

48. Richard Husband.
52. Edward Tyer.
140. Oliver Rice Chase.
174. Adderley Willcocks Sleigh.
190. Archibald Lockhart Reid.
192. Thomas Wicksteed.
201. Patrick Moir Crane.
240. William Wright & George Brown.
456. Auguste Edouard Loradoux Bellford.
852. John Miller the younger and Michael Burke.
974. Walter Macfarlane.
992. John Henry Johnson.
1022. John Henry Johnson.
1034. Francis Peter Berquez.
1037. Alfred Vincent Newton.
1038. Eben Norton Horsford.

*Sealed July* 11, 1854.

89. Patrick O'Malley.
96. Charles Frederick Stansbury.
98. James Newall.
144. Richard Roberts.
261. Adolphe Mohler.
267. Peter Armand Lecomte de Fontainemoreau.
300. Alphonse François Damiens Duvillier.
305. Barthelemy Urbain Bianchi.
331. James Mitchell.
355. Louis Faure.
438. William Hunt.

715. John Roberts.
817. John Robert Johnson.
1053. Alfred Vincent Newton.
1105. John Beads.
1111. John Maclean, jun., and Thomas Finlayson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*A. Z.*—You had better forward us the manuscript.

*I. G.*—We must defer our replies to your questions until next week.



## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1615.] SATURDAY, JULY 22, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## PYM'S PATENT ORE-CRUSHER AND SEPARATOR.

Fig. 1.

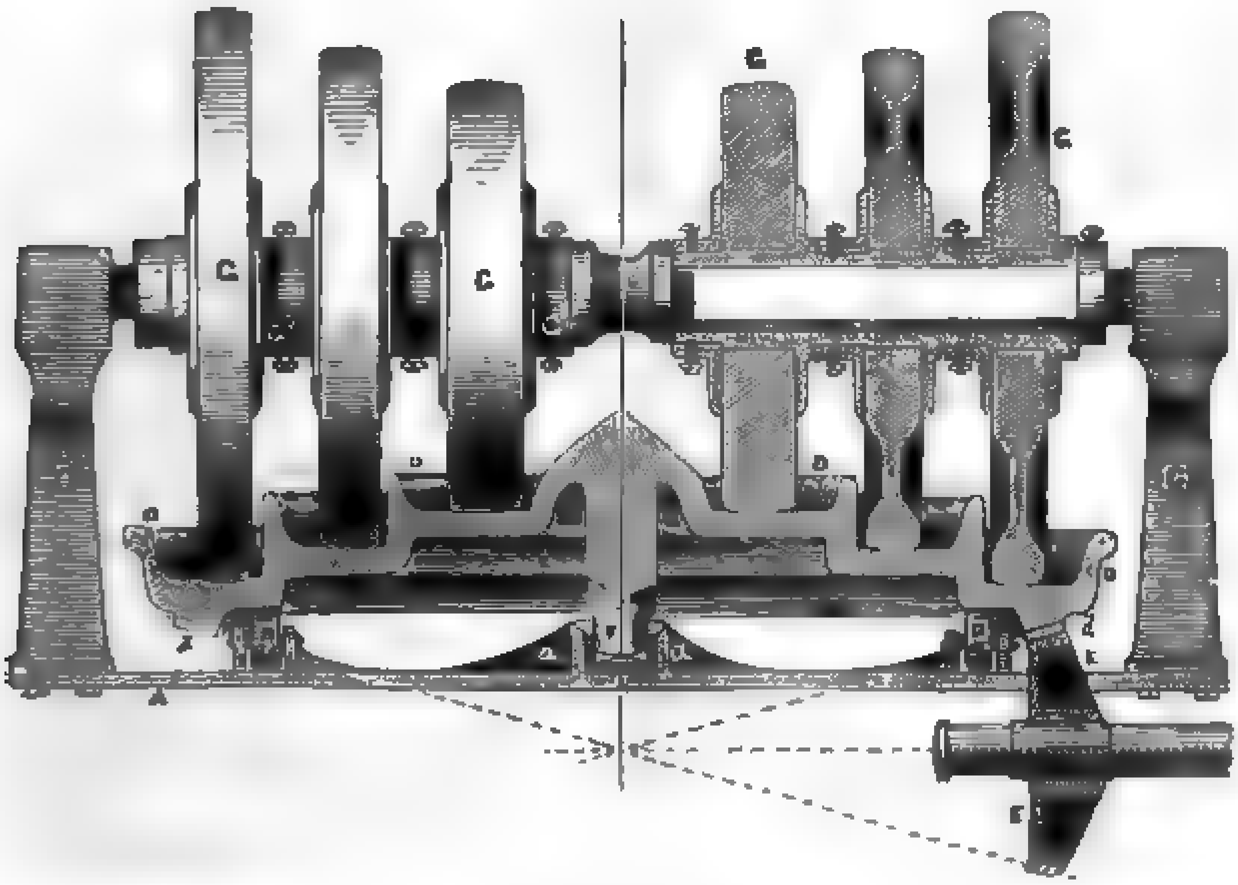


Fig. 4.

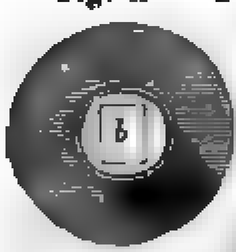


Fig. 3.

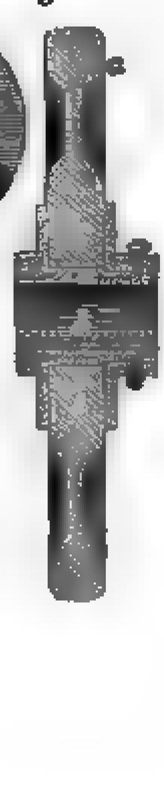


Fig. 2.

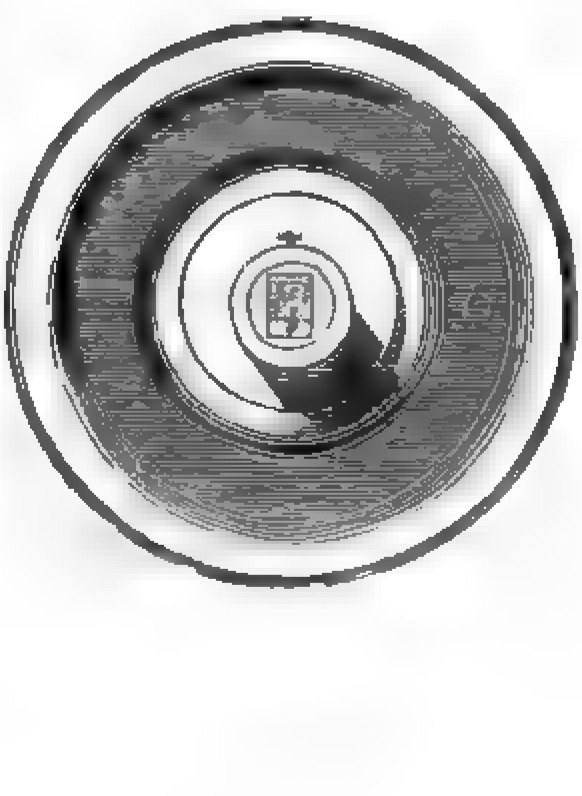
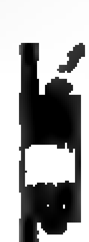


Fig. 6.

Fig. 5.

Fig. 7.



## PYM'S PATENT ORE-CRUSHER AND SEPARATOR.

Another machine for pulverizing auriferous and other ores has been patented by Mr. J. Pym, of Pimlico. It consists of a basin or mortar, in which are formed, at different levels, circular grooves, wherein a series of runners are made to revolve, water being used to carry off the earthy and lighter matters from the ore, which is retained in the bottom of the grooves.

In treating auriferous ores quicksilver is placed in the grooves in order to form an amalgam with the gold, and one or more plug-holes are provided, through which the amalgam may be drawn off. The mortar may be either stationary or made to rotate, and the runners may be caused to revolve by contact with the mortar where the latter also revolves, or they may have an independent rotary motion communicated to them.

Fig. 1 of the accompanying engravings is an elevation, chiefly in section, of one of Mr. Pym's improved grinding and separating machines, in which the runners revolve by frictional contact with the mortar. A A is the bed-plate, with a bearing at *a* for the support of the vertical axis of the mortar; B B are two of a series of friction-rollers for the support of the outer rim of the mortar; C C are standards bolted to the bed-plate, A A, on the top of which are bearings in which the axis of the runners is supported and revolves; D is the basin or mortar with three annular grooves; it carries teeth, *d d*, on its under surface, into which the bevel-wheel, E, gears, and by which the mortar is made to rotate upon the central pillar, F, and the friction-rollers, B, B. The outer side of each groove is perforated, or is provided at intervals with sieves, let into it to allow of the ore, as it is reduced, to flow through from the upper groove to that next below it. The ore and water are fed from a hopper, or other source, into the centre of the machine, and the apertures or sieves in the sides of the grooves diminish as they recede from the centre. G G G are the runners, which may be of stone or metal. These runners are free to revolve upon the bosses, $G^1$ $G^1$, figs. 1, 2, and 3, which have a long slot, *b*, figs. 1, 2, 3, 4, and 5, cut in them, through which the shaft, *c*, passes, the slot, *b*, being perpendicular to the shaft. Fig. 4 is a front view of one of the bosses; and fig. 5 a section of the same. Figs. 6 and 7 are views of a disc or plate which fits on to the boss at *e*, fig. 5, and is held in its place by pinching-screws. By means of these arrangements each runner has an independent action, so that it may rise over any lump or collection of ore too large to be immediately crushed.

## ON THE FURTHER APPLICATION OF STEAM TO NAVAL PURPOSES.*

But few mechanical persons will doubt that the application of steam to naval purposes is susceptible of great extension. There is nothing in the ordinary circumstances of a ship at sea that would interfere with its extended use that does not now exist as an objection to its present employment for purposes of propulsion. We are therefore not at all surprised to find that attention is being directed to this subject, which is one that may very fitly engage the thoughts of intelligent and experienced persons. Captain Shuldham, who is favourably known as the author of many useful suggestions, is the first person who has attempted to treat the subject comprehensively, and we at present propose simply to lay his scheme at some length before our readers, without ourselves discussing the merits of it.

The object of his pamphlet is to show that a considerable reduction might be made in the navy estimates, by substituting, in part, steam power for manual labour, as some equivalent to the vast increased expenditure of our steam navy, as compared to that composed only of sailing ships, which expenditure, he believes, will undoubtedly increase, since we must look forward to the time when, between the navies of the world, there will be (as there is now in the mercantile navy) the *greatest competition* respecting the best forms and dimensions for superior sailing and steaming, or for both combined; and as those qualities are of more importance to inferior navies, no expense, he conceives, will be spared to gain great results, by the neglect of which our naval superiority would be diminished. He contends that a length, far exceeding that of our present ships, would be the principal requirement to produce such results, and the obtainment of this would of course add proportional expense to the building or alteration of our ships, besides the necessity of lengthening the building slips and docks in Her Majesty's dockyards, which are too confined in area to admit of such alterations, and would have to be enlarged.

After stating his conviction that the

* Suggestions for Reducing the Manning of the Navy to Half its Present Complement; including others for Isolating the Engine-room, &c. Also a Suggestion for Coast Defences. By Molyneux Shuldham, Commander, R.N., London: Saunders and Otley, Conduit-street, 1854.

number of our seamen and marines might be reduced one half by his arrangement, he argues that if a ship were navigated by only the half of her crew, she would consequently only require stowage for the half of her present water and provisions, including whatever else she might require in additional coals and iron ballast, as the case might be, to bring her down to her usual draft of water. The present capacity of the hold being so much greater than would in that case be needed for stowage, it would admit of the orlop deck being placed considerably lower than it is at present—in fact, quite low enough to be out of the range of shot. This arrangement is the principal feature in the plan, for on this deck, secure from the effects of the enemy's fire, he proposes placing all the machinery for working the sails, guns, anchors, pumps—in fact, doing much more than make up for the loss of the manual labour of half a ship's crew. Besides the lowering of the orlop deck, the present arrangement of it would be completely changed. The wings would be led completely round the vessel, for the greater convenience of stopping shot-holes, which in future naval battles may be expected to be larger and more numerous than in former wars, so that the stopping of them would require great skill and ingenuity. Next to the wings, Captain Shuldham proposes a range "fore and aft" (excepting the engine-room), for store-rooms, sail-rooms, and cabins, leaving occasional passages into the wings; and another "fore and aft" range would be set apart for all the machinery intended to be worked by steam. The midship range would be reserved for machinery for working the anchors and pumps, for the doctor's department, berths, or, in fact, for space for any required purposes. Thus, the orlop deck would be longitudinally divided into seven long ranges, viz., two wings, two for store-rooms, &c., two for steam machinery, and one amidships.

The above arrangement being understood, we may now notice the proposed method of working the guns as the most important operation. The author proposes to work by steam power, only the two lower tier of guns in line-of-battle ships, and those on the main deck in frigates and sloops, for two reasons: the one, that complication might be diminished, and the other, that the crew might be more at hand to repel boarders. For this purpose he suggests the putting in motion of a range of rods connected by couplings at suitable lengths, extending the whole length of the battery, and to those rods opposite to each of the guns are to be placed cylinders or barrels, either fixed, or allowed to run loose at pleasure. An explanation of the manner of working one gun will be sufficient. If it could practically be well contrived, the author would prefer only a single rope for the operation of running out the gun, one end of which rope he would fasten to the gun-carriage, and then pass the other over a perpendicular sheave, through a hole in the deck, then through another sheave in the orlop, and finally make it fast to the cylinder. There would be tubes in the store-rooms, fixed close to the bulk-heads, or outside in the passages to the wings, for leading the gun-ropes through, by which means injury to the ropes, and accidents, which their quick motion might cause, would be avoided. "Suppose the rod," says Captain Shuldham, "in constant motion by steam power, and the cylinder running loose upon it, it is clear that it has only to be set fast, to enable the gun to be run out, by a few turns of the cylinder or barrel; the affixing it to the rod must be done at will by the captain of the gun, who, by jerking a line led through a hole through the deck just above the cylinder, should set it fast, when the gun would be immediately run out. That done, the next question would be, how is the cylinder to be let loose again, for if it is not, just at the right time, the rope would be broken? In answer to which, I should say, that I would manage it so, that the rope, after it had done its duty, should itself set the barrel free; thus the men who loaded the gun could work it without any aid whatever from the men quartered on the orlop deck, thereby preventing all confusion and mistakes."

An objection undoubtedly might be made as to the liability of the rope being shot away, and consequently the gun rendered useless for a time; this objection is answered in the following ingenious manner:

"We will suppose the rope to be a 3-inch one (more or less is of no consequence), or an inch in diameter; when the gun was run out, there would be about eight feet of it in length exposed to the enemy's shot—that is, 96 inches in area; and when the gun was run in, there would be about double that area, making the averaged exposure only 144 inches; and supposing the gun to be a 32-pounder, which is usually worked by thirteen men, I should imagine that on the plan I am proposing, that four men would be sufficient to load and train the gun; thus the area of nine men exposed to the casualty of shot, may be brought in juxta-position with that of the rope; but as their area would be so various according to their relative positions, combined with the direction of the shot, this renders comparative calculation impossible. Again, men when killed or disabled cannot be replaced, whereas I should

have plenty of spare gun-ropes, all at hand, to be fixed to the cylinder, and then rove upwards by the men stationed on the orlop deck, who would be sure to see when a gun-rope was shot away, by its non-action."

If two tier of guns were to be worked, then the gun-ropes of the upper deck would be led between the guns of the lower, and through perpendicular tubes, if their rapid motion should be inconvenient to the men working the lower-deck guns.

"By the above plan, there would be a saving of nine men in the working of each gun; and supposing the lower gun-deck battery to consist of seventeen 32-pounder long guns, they would be worked by sixty-eight men, instead of the usual number of 221, making a saving of 153."

The next thing taken into consideration, is the working of the anchors by steam, which the author proposes should be done by the present capstan, in such manner that it could be worked either by manual labour or by steam power; the machinery connected with the latter would be on the orlop deck, so as to be kept free from injury by shot, but the cables laid on the lower gun-deck, as usual. A greater amount of power and velocity could be given to the capstan than it usually has communicated to it by men working at the capstan bars, so that the anchors could be worked quicker when required; and slower motions, and consequently greater power might be imparted when needed, to work the cables in a strong gale, with a head wind, or to weigh them out of the ground; all this, together with the methods of giving velocity to an upright spindle, every engineer is conversant with, and therefore the author thinks it needless to comment upon it any further.

Those who are ignorant of the interior of a man-of-war may be informed, before we proceed further, that chain-pumps are worked by long iron winch-handles, on the lower gun-deck, just clear of the guns, by gangs of men, so that when a ship in action receives shot-holes between wind and water, and therefore is required to be kept afloat by pumping, the men, who are perhaps in an exhausted state, owing to their quick mode of firing, are taken from their guns to man the pump-winches, which is a laborious, and sometimes a never-ending task.

"Now, as all maritime nations have, during the long peace, taken great pains in improving their artillery practice, and also in greatly increasing the calibre of their guns, numerous and large shot-holes may in any future battle be expected between wind and water, even to sink ships; the endeavour to prevent which requires the most efficient plans which ingenuity can devise for pumping and stopping shot-holes; for victory may in a great measure depend on that fleet which can be kept the longest afloat."

Taking this view of the question, Captain Shuldham proposes the following improvements, viz., that the pumps, instead of being worked on the lower gun-deck by manual labour, shall be worked by steam power on the orlop, below the range of shot, any velocity short of that which would injure the pumps being given to them, so that they may discharge a much greater volume of water than is delivered by manual labour. The confusion arising from the ordering of men from the guns to man the pump-winches, might be avoided by employing one engineer, or even a boy, to connect the steam machinery, and set the pumps to work, and keep them working until the ship became actually in a sinking state, or until they had pumped her out, thus enabling her to fight to the last, as the case might be. The pumpdale would be fixed, as usual, on the lower gun-deck, or close under it, which would unavoidably expose it and the upper part of the chain-pump to the enemy's shot; but that exposure is not to be contrasted with the gang of men required to work the pump-winches.

Before proceeding to explain the other machinery required to be used on the orlop deck, the author advocates very strongly an important improvement which, in his opinion, should be adopted in all sea-going steam-vessels:

"Every steam-engine room," he says, "should have water-tight bulk-heads up to the lower gun-deck, or to the orlop, of sufficient strength to resist the external pressure of water of equal altitudes to them; if this were so, then the fires could not be extinguished until the ship was in a sinking state. Had the furnaces, when first steam propulsion was introduced, been so sheltered from water in a vessel's hold, how many lives would have been saved! It would require pages to enumerate all the awful shipwrecks, when the furnace fires were put out almost immediately after a ship struck, which would not have happened had the engine-room been isolated as I propose, unless the base of it were injured."

After alluding to the wreck of the *Victoria*, he continues: "But, although the plan assumes so much importance in the merchant navy, it is more than doubled when applied to Her Majesty's ships. Suppose a naval battle between two steam-sailing vessels of equal force, the one having her engine-room isolated, and the other not; each of them may be expected to receive many large shot-holes between wind and water, and consequently both having water in their holds, the latter would have her fires extin-

guished very soon, her engineers smothered by steam and smoke, unless they were lucky enough to make their escape; and her steam power, on which her success might depend, would be at once annihilated, and her position be left to the tender mercies of the wind, should there be any, and should her masts be left standing; whereas the former would, in conjunction with her superior mode of pumping, have her steam power available to the last, even until she was in a sinking state, thus giving her time to save the lives of her crew by her boats, or by any other means hitherto proposed, or to seek succour should any sail happen to be in sight." He also suggests that it would not be a bad measure to accompany this plan by a similar isolation of the magazine, thus rendering the powder available until the last, and thus also being enabled by a quick method to inundate the magazine, should the ship be set on fire, an event which has already more than once occurred in the present war, as our readers will remember.

(*To be continued.*)

## ON THE ROTATION OF THE PENDULUM.

BY ALFRED DAY, ESQ.

Having been one of the parties who, in an early stage of the inquiry, proposed a simple original solution of the phenomena of the rotation of the pendulum, which is now commonly adopted without acknowledgment, and which has been again and again repeated both here and in America, I am desirous of correcting some unsatisfactory representations which still find their way into print in works of a respectable class. I refer to the account given of the problem in a manual of the physical sciences by Dr. Golding Bird and Mr. Brooke, where the correct explanation is also given, being exactly the same as my own, even to the form in which the trigonometrical relation is expressed, the same fraction, $\frac{\text{cos. } \lambda}{\text{cot. } \lambda}$, occurring in both. But this explanation is accompanied, or rather prefaced, by some remarks, which represent the problem, first, as having excited much more attention than it deserved; next, that the rotation of the pendulum is not an immediate effect of the earth's rotation; and thirdly, that the rotation of the pendulum is only an *apparent* rotation. Now on this I cannot help remarking, that the problem would have been most interesting, and deserving all the scientific examination it received, if only as a purely speculative or abstract one; and it was very remarkable that the precise case had never been discussed. As it was, it took mathematicians by surprise, baffled not a few respectable professors of the science, and was wrongly apprehended by several analysts of considerable eminence. None of the analytical solutions, if such they can be termed, that have from time to time appeared in this country, have established anything more than is done with far greater clearness and simplicity by the explanation given in the work referred to; and the whole thing, notwithstanding its great interest and novelty, has sunk into temporary contempt and neglect, as if the scientific republic was rather ashamed of having allowed so much discussion and so much algebra to be wasted on a thing so readily demonstrable by a person tolerably conversant with Euclid only, or, to say the least, with Euclid and the first elements of plane trigonometry. By way of retaliation, there is no glory to be got out of it, the problem is now never mentioned, and a large body of people at this moment look upon the whole thing as tacitly given up, notwithstanding that the exact experiments of Mr. Bunt, certainly undertaken with no bias in favour of bringing out the precise result, have proved it, in a great variety of trials, to be true in practice, which is by no means necessary to establish the truth of the theoretic reasoning. It is not, however, as a speculative case that the problem is of the highest interest, but as an immediate proof of the earth's motion round its axis; and the discovery was hailed as important chiefly on this ground by the members of the French Institute. It is true you do not see the earth's rotation any more than before, nor does the pendulum move away at a rate necessarily corresponding with that in which the former is performed. I may state the real value of the illustration thus. It is only within a comparatively recent period of the world's history that the apparent motion of the heavens has been finally reconciled with the supposition of a motion in the spectator on the earth's surface, and not in them; and while no objection can be raised against the adequacy of this supposition to account for what is witnessed, there are a hundred reasons why it should be adopted implicitly, without one to be urged on behalf of the ancient hypothesis which makes the earth stand still. We have heard indeed of incredulity on this point, but it must be confined to those who, with their systems of philosophy or theology, stand as still as the earth on their theory; and to offer a serious refutation would be loss of time, without the hope of bettering the state of their convictions. Notwithstanding, however, that the mass of men are fully agreed on this question, and that the great conspiracy of argu-

ments tends to render the conclusion in the highest degree probable, and to the philosopher certain, it cannot be denied that a diurnal rotation of the heavens would produce effects such as those ordinarily observed, and that the reasons which lie against it are not those which can be easily understood by persons unskilled in physical demonstration. We are glad then of a new fact, which, though it does not really make the rotation of the earth more a sensible phenomenon than before, shows that a relative motion exists between the earth and other independent planes, in which the same positions do not necessarily recur after twenty-four hours, and which are in no way affected by any rotation of the sidereal heavens, and yet are wholly explicable on the hypothesis of the earth's rotation round its axis in twenty-four hours, and on no other. To a person who views the pendulum experiment, the rotation of the plane of its vibration is readily and speedily manifest; and because this may be shown to depend on the rotation of the earth, it is not unnaturally designated a making the earth's rotation visible. We do not, however, apart from reasoning, attribute the effect observed to the motion of the earth, any more than we do the motion of the stars about us to that cause; for what we appear to see is strictly a motion of the plane of vibration round the zenith as a pole. It may suit the purpose of popular explanation to say that the plane of the pendulum's vibration remains unchanged while the earth rotates under it; but a little consideration shows that this is not strictly true, and the conception of what does take place becomes more difficult than in the case of the apparent motion of the heavens, since the pendulum being carried at its point of suspension with the earth, appears to be one with it. But though the earth's diurnal rotation is less directly proveable in this way, it is far more conclusively so than it is by the motion of the stars. In these last, the motion having existed from the commencement of all things, might have been originally impressed as well as that of the earth; but with the pendulum set in motion by human agency, and continuing to vibrate without solicitation to the right hand or left, on the supposition of the earth being at rest, no such apparent rotation could be brought about on any known physical law. It is, therefore, the earth that moves, not at the rate of the pendulum nor round the pendulum-wire when at rest as an axis, though this it might do if this were consistent with the observed motions of the stars; but round another axis pointing to another star, and at a rate coinciding with the apparent rate of the sidereal revolutions. It is therefore a sensible proof of another kind than any previously known to exist, and of directly sensible proofs measured by the eye in short intervals of time, the most conclusive in its kind. The value of the whole argument may be thus stated. Either the heavens or the earth rotate once in twenty-four hours, or both move by a joint motion away from each other equivalent to this in amount; and either of these conditions is abstractedly possible, so that no conclusion can be drawn. In this latitude the pendulum rotates in about thirty hours, or the earth in twenty-four; and as there can be no assignable reason why the former should do this without a cause, the rotation of the earth in twenty-four is a fact for the rational being, since it is clear that no supposition of the observed motion being partly in the earth and partly in the heavens will fulfil the second set of conditions. The experiment of the pendulum is, therefore, very correctly designated as a making visible the earth's rotation, though hardly in the sense popularly attached to it; and its importance cannot, we think, be overrated. So much then for the second objection; and I shall now proceed to show that the rotation is to all intents and purposes real, and not merely apparent on the part of the vibrating plane. I have elsewhere, in a published diagram, shown that the pendulum's actual rotation is the resultant of two sets of continually-exerted forces, one tending to keep the pendulum swaying parallel to itself, the other to make its point of suspension and the line which the pendulum would occupy if at rest rotate obliquely to the axis of the two circles described by the point of suspension and the ball at the mean of the oscillation. Shortly after the publication in question, I constructed a simple mode of illustrating the fact. Cut out two circular discs of card, and make an equal number of cogs or teeth in the rim of each. Paste one of these on a larger circular disc and concentric with it, and cut both through along any radius from the circumference to the centre. If now we draw a diameter on the other toothed disc, and cause it travel round by placing the teeth of the two discs in one another in the manner of ordinary wheels when acting on each other, but so that the larger disc shall remain motionless, we shall find that this line will have rotated once for one entire revolution of the moving wheel round the circumference of the fixed one. If now we coil up the large disc with its attached rack into the shape of a cone, so as to hide some of the teeth, our index-line will not rotate once during the revolution of its disc over the entire surface of the rack on the conical surface;

and the more acute the cone is, the smaller the amount of rotation. This is not only analogous to the case of the pendulum, but it is exactly the same in amount, when the plane sectional angle of the cone is altered proportionally to the latitude of the place where the pendulum is set swinging.

Great confusion has arisen in many minds with reference to this problem from not separating two things, a free and a constrained and conditioned motion, and not distinguishing what is real from what is apparent. Thus, if a cone be set revolving on its axis, a fixed straight line on the surface of the cone will, after one entire revolution, be in the same spot, and we say of it that it has not rotated round any point in itself; but yet if a plane be conceived to pass through the line in its first position and the axis of the cone, and the projection of the line after a quarter revolution falling perpendicular on this plain be drawn, the two lines will cut one another at an angle equal to half the plane sectional angle of the apex of the cone, and in half a revolution this angle will be doubled. The partial rotation, however, in the first half of its course, which reaches its maximum in half a revolution of the cone, is in fact retrograde during the second half, and at the completion of the whole period all things are as they were. The whole of this is a constrained motion, during which every point in the line moves in a circle, but every point with a velocity different from that of its neighbour and in a different circle. This is totally different from the case of a line occupying at each infinitesimally-consecutive instant a position parallel to itself, and thus having all its points moving uniformly in equal circles, or constrained to keep to the surface of the revolving cone, so as to cross always a given point on it, or, in other words, moving at the same rate as the cone. It has been sufficiently and irrefragably demonstrated, that while the cone continues to revolve in the same direction, the line so circumstanced would constantly rotate in one direction round that point which it always crosses; and that though this result is obtained by the tendency of the line to keep parallel to itself, coupled with the constraint applied to it, it will not, after a complete revolution of the cone on its axis, bring the line into parallelism with its first position, but only after the lapse of a longer period. Hence the rotation is real, not merely *apparent;* and were there no apparent rotation, there must have been a real retrograde force of rotation applied to the plane of oscillation, so as to have obliterated all the advance we actually see in practice. I have met with other gentlemen of mathematical education and reputation, who have persisted in calling this rotation an apparent one, which it certainly is, and something more.* When we talk of the apparent rotation of the heavens, we mean that they do not revolve, but only the earth, in twenty-four hours, all things being replaced. If the earth really revolves in twenty-four hours, it is certain that the oscillation of the pendulum is not in the same direction, and consequently it has rotated, unless any one is absurd enough to maintain that the rotation of the earth itself varies its period at different latitudes.—*Philosophical Magazine.*

## ON THE POSITION OF FIRE-PLACES.

BY DR. NEIL ARNOTT, F.R.S.†

This is the fit place for remarking on the fashion, lately introduced in this country, of placing the fire-grates much lower down than formerly—in some cases, on the very hearth; the reasons usually assigned being that a low fire burns better, or gives out more heat from the same quantity of fuel, than a higher; and, because lower and nearer the floor, that it must warm the carpet better, and so lessen the evil of cold feet. Now, both these suppositions are curious errors or delusions, having their origin in popular misconceptions respecting heat, and particularly respecting the radiation of heat.

Radius is the Latin word for the spoke of a wheel, and anything which diverges or spreads around from a centre, in some degree like spokes, is said to radiate. Light and heat are of this nature; the portion of either which passes in a straight line from the centre is called a ray.

The simplest observation teaches all that a lamp placed in the middle of a room radiates its light and heat nearly equally in all directions; and most persons are aware that if an opaque mirror be placed close to a lamp on one side, it not only intercepts

* There is no rotatory tendency in the plane of oscillation, excepting in so far as this is produced as a result of the earth's constraint on the point of suspension, in other words the rotatory effect is due to the earth. In this sense it is the earth's rotation made visible, though the angular motion is slower than that of the earth: and the case may be compared to the motion of the box containing the main-spring of a watch, as evidenced by the motion of the hands.

† The subject of this article was referred to by Dr. Arnott, during the reading of his paper on the Smoke-consuming Fire-grate, at the Society of Arts, on the 10th of May last; and as it has been deemed important, he has been good enough to give his remarks in writing (for publication in the Society's Journal), and they may be taken as forming part of his original paper.

all the rays that fall upon it—and that means nearly half of the light given out—but it returns or reflects these rays back in contrary corresponding directions, and nearly doubles the illumination in those directions.

Most persons, also, have observed that if a fire, or a red-hot mass of metal be placed in free space, it radiates its heat as well as its light nearly equally in all directions; but many do not learn, by their unaided observation, that if a surface of any substance, like firebrick, which strongly resists the passage of heat through it, be placed near a fire, it not only intercepts the heat-rays falling on it, but after absorbing them, and so becoming heated, often to redness, it then reflects and radiates back the greater part of the heat, almost as if it were additional hot fuel in the fire, and thereby nearly doubles the warmth felt in directions away from the surface.

Neither does common observation make persons aware of the truth, that of the heat produced by combustion in a common fire, one part—being somewhat more than half—is diffused, like the light, by radiation, into the open space around, and the remainder is given, by contact and conduction, to the air which supports the combustion, and to the solid material of the fire-place. Thus, with a common open fire-place, it is the radiant heat almost alone which warms the room, the remainder either at once combining with the burned air or smoke, and passing up the chimney, or being given by the heated grate to pure air, which touches that, then passing into the chimney with the smoke.

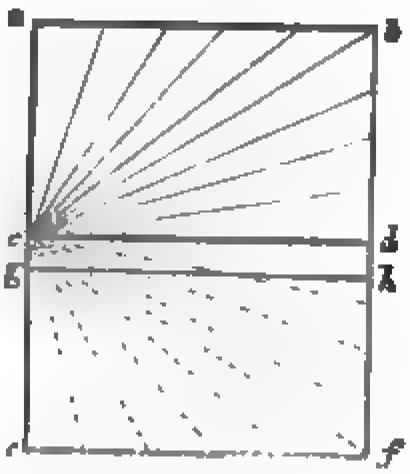
And, lastly, many persons do not at first learn the truth, that the rays of heat passing through pure or transparent air do not at all warm that air, but warm only the solid or opaque bodies by which the rays are intercepted, and that thus the air of a room is warmed only at second-hand, by contact with the solid walls and furniture, which, having intercepted the heat-rays, have themselves first become heated. Yet most educated persons know similar facts, such as that the sunbeams, bringing both light and heat to the earth, as they descend to warm the hottest valleys or plains of the earth, pass through the upper strata of the atmosphere, which are always of a temperature much below freezing. This is proved by the fact that all lofty mountains, even under the equator, are capped with never-melting snows, and that the higher the peaks are—and, therefore, the nearer to the sun—the colder they are. Thus, also, all persons who have attended to the subject know that aeronauts, in their balloon-car, if they mount very high, would be frozen to death but that they are protected by very warm clothing. Another fact of the same kind is, that a glass globe, filled with cold water, or even ice, may in the sun's rays be used as a burning-lens.

These explanations being premised, the two popular delusions respecting the low fires become at once apparent.

1st. The supposition that fuel burnt in a low fire gives out more heat, has arisen from the experimenter not reflecting that his hand held over the low fire feels not only the heat radiated from the fire itself, but also that reflected from the hearth close beneath it, which second portion, if the grate were high, would have room to spread or radiate downwards and outwards to the more distant floor or carpet, and to warm them.

2nd. The notion that the fire, because near the floor, must warm the carpet more, springs from what may be called an error in the logic of the reasoner, who is assuming that the hearth, floor, and carpet, being parts of the same level, are in the same predicament—the truth being, however, that in such a case the hearth within the fender gets nearly all the downward rays, and the carpet almost none—as a candle held before a looking-glass at a moderate distance diffuses its heat pretty uniformly over the whole, but if moved close to one part of the glass, it overheats, and probably cracks that part, leaving the rest unaffected. A low fire on a heated hearth is to the general floor or carpet of a room nearly what the sun, at the moment of rising or setting, is to the surface of a field. The rays are nearly all shooting upwards from the surface, and the few which approach it slant obliquely along, or nearly parallel to the surface, without touching, and therefore without warming it.

The annexed diagram serves to elucidate these facts.




*c* represents the fire-place or centre of radiation, with rays diverging from it into all free space around.

*a c* the wall in which the grate is set, and which can receive none of the direct rays—

as is nearly true of the floor also if the fire be on the hearth.

*a b* the ceiling.

*b d* the wall opposite to the fire.

*c d* the floor, with the fire on or close to the hearth. If there were no floor at all, these rays would shoot as abundantly down to the bottom and walls of the room below, as to the ceiling and walls of the room above; but the hearth-stone of the floor, *c d*, first intercepts all the inferior rays, and then radiates them up to the ceiling, leaving the floor unsupplied, unless by secondary radiation from the ceiling and walls.

*g h* represents a floor at a moderate distance below the fire. It is seen, by where the ray-lines intersect this floor, that much of the heat of the fire must spread over it, and chiefly between the middle of the room and the grate where the rug is, and where the feet of the persons forming the fireside circle are placed.

Striking proof of the facts here set forth is obtained by laying thermometers on the floors of a room with a low fire, and of a room with the fire, as usual of old, at a height of about 15 or 16 inches above the hearth. An experiment, tried in two such rooms, in both of which thermometers on the pianofortes, four feet above the floor, stood at 62°, showed the carpet, not far from the hearth, to be at 56° with the low, and at 73° with the high fire.

As would be anticipated by a person understanding the subject aright, low fires make cold feet very common, unless to those who sit near the fire with their feet on the fender; but deceived by their fallacious reasoning, the advocates are disposed to blame the state of their health or the weather as the cause, and they rejoice at having the low fire, which can quickly warm their feet when placed near it. A company of such persons seen sitting close around their fire, with thankfulness for its warmth near their feet, might suggest the case of a party of good-natured people duped out of their property by a swindler, and afterwards gratefully accepting as charity from him a part of their own property.

Many persons have been prevented from detecting the truths connected with low fires by the fact, that where the chimney breast or opening is also made low, the mass or stratum of comparatively stagnant warm air in the room is deeper or descends lower than where the chimney opening is high; and the room thus arranged may be, except near the floor, warmer than before. But advantage from this arrangement is often missed by the chimney-throat being left too wide, causing strong cold draughts below; and where there are many persons in the room, the possible good is more than counterbalanced by the ventilation above being rendered in proportion more faulty. In the new smokeless grate there is the advantage of a low chimney-opening, although with a high fire; and yet the ventilation is maintained perfect for any amount of crowd by the ventilating-valve, placed near the ceiling of the room.

## ON THE COMMON PLAN OF ANIMAL FORMS.

BY T. HUXLEY, ESQ.*

The lecturer commenced by referring to a short essay by Göthe—the last which proceeded from his pen—containing a critical account of a discussion bearing upon the doctrine of the Unity of Organization of Animals, which had then (1830) just taken place in the French Academy. Göthe said that, for him, this controversy was of more importance than the revolution of July which immediately followed it,—a declaration which might almost be regarded as a prophecy; for while the *Charte* and those who established it have vanished as though they had never been, the doctrine of Unity of Organization retains a profound interest and importance for those who study the science of life.

It would be the object of the lecturer to explain how the controversy in question arose, and to show what ground of truth was common to the combatants.

The variety of forms of animals is best realised, perhaps, by reflecting that there are certainly 200,000 species, and that each species is, in its zoological dignity, not the equivalent of a family or a nation of men merely, but of the whole human race. It would be hopeless to attempt to gain a knowledge of these forms, therefore, if it were not possible to discover points of similarity among large numbers of them, and to classify them into groups, one member of which might be taken to represent the whole. A rough practical classification, based on obvious resemblances, is as old as language itself; and the whole purpose of zoology and comparative anatomy has consisted chiefly in giving greater exactness to the definition and expression of these intuitive perceptions of resemblance.

The lecturer proceeded to show how the celebrated Camper illustrated these resemblances of the organs of animals, by drawing the arm of a man, and then by merely altering the proportions of its constituent parts, converting it into a bird's wing, a horse's fore-leg, &c. &c. Organs which

* Being the substance of a paper recently read at the Royal Institution.

can in this way be shown to grade into one another, are said to be the same organs, or in anatomical phraseology are *homologous*; and by thus working out the homologies of all the organs of the vertebrate class, Geoffroy, Oken, and Owen,—to the last of whom we are indebted for by far the most elaborate and logical development of the doctrine,—have demonstrated the homology of all the parts of the vertebrata, or in other words, that there is a common plan on which all those animals which possess back-bones are constructed.

Precisely the same result has been arrived at by the same methods in another great division of the animal kingdom—the *Annulosa*. As an illustration, the lecturer showed how the parts of the mouth of all insects were modifications of the same elements, and briefly sketched the common plan of the Annulosa, as it may be deduced from the investigations of Savigny, Audouin, Milne, Edwards, and Newport.

Leaving out of consideration (for want of time merely,) the *Radiate* animals, and passing to the remaining great division, the *Mollusca*, it appears that the same great principle holds good even for these apparently unsymmetrical and irregular creatures; and the lecturer, after referring to the demonstration of the common plan upon which those Mollusks possessing heads are constructed,—which he had already given in the "Philosophical Transactions,"—stated that he was now able to extend that plan to the remaining orders, and briefly explained in what way the "Archetypal Mollusk" is modified in the *Lamellibranchs*, *Brachiopoda*, *Tunicata*, and *Polyzoa*.

We have then a common plan of the *Vertebrata*, of the *Articulata*, of the *Mollusca*, and of the *Radiata*,—and to come to the essence of the controversy in the Académie des Sciences,—are all these common plans identical or are they not?

Now if we confine ourselves to the sole method which Cuvier admitted—the method of the insensible gradation of forms—there can be no doubt that the Vertebrate, Annulose, and Molluscan plans are sharply and distinctly marked off from one another by very definite characters; and the existence of any common plan, of which they are modifications, is a purely hypothetical assumption, and may or may not be true. But is there any other method of ascertaining a community of plan beside the method of gradation?

The lecturer here drew an illustration from philology—a science which, in determining the affinities of words, also employs the method of gradation. Thus, *unus*, *uno*, *un*, *one*, *ein*, are said to be modifications of the same word, because they pass gradually into one another. So *Hemp*, *Hennep*, *Hanf*, and *Cannabis*, *Canapa*, *Chanvre*, are respectively modifications of the same word; but suppose we wish to make out what, if any, affinity exists between *Hemp* and *Cannabis*, the method of gradations fails us. It is only by all sorts of arbitrary suppositions that one can be made to pass into the other.

Nevertheless modern philology demonstrates that the words are the same, by a reference to the independently ascertained laws of change and substitution for the letters of corresponding words, in the Indo-Germanic tongues; by showing, in fact, that though these words are not the same, yet they are modifications by known developmental laws of the same root.

Now Von Bär has shown that the study of development has a precisely similar bearing upon the question of the unity of organization of animals. He indicated, in his masterly essays, published five and twenty years ago, that though the common plans of the adult forms of the great classes are not identical, yet they start in the course of their development from the same point. And the whole tendency of modern research is to confirm his conclusion.

If, then, with the advantage of the great lapse of time and progress of knowledge, we may presume to pronounce judgment where Cuvier and Geoffroy St. Hilaire were the litigants, it may be said that Geoffroy's inspiration was true, but his mode of working it out false. An insect is not a vertebrate animal, nor are its legs free ribs. A cuttlefish is not a vertebrate animal doubled up. But there was a period in the development of each, when insect, cuttlefish, and vertebrate were undistinguishable, and had a *common plan*.

The lecturer concluded by remarking, that the existence of hotly controverted questions between men of knowledge, ability, and especially of honesty and earnestness of purpose, such as Cuvier and his rival were, is an opprobrium to the science which they profess. He would feel deeply rewarded if he had produced in the minds of his hearers the conviction that these two great men, friends as they were to one another, need not to be set in scientific opposition; that they were both true knights doing battle for science; but that as the old story runs, each came by his own road to a different side of the shield.

## A NEW VELOCIMETER;

### OR, INSTRUMENT FOR MEASURING THE SPEED OF SHIPS AND VELOCITY OF CURRENTS.

THE object of this instrument is to mea-

sure the speed of ships, and the velocity of currents of air and water. Its principle is based on that of the vena contracta, which was discovered a century ago by Daniel Bernouilli, and has since been applied by Venturi in the double-cone tube which bears his name.

Mr. Overduyn, a Professor at the Royal Academy at Delt, has invented a velocimeter, the idea of which is based on the negative pressure, or rather the sucking action resulting therefrom, at the narrow gorge or section, where the two tubes of which Venturi's tube is composed, intersect each other. A tube, constructed on the same proportions as Venturi's, is fixed to the vessel in a direction parallel to its axis, the base of the smaller cone being turned towards the bow. A hole is made in the side at the intersection of the cones, into which a small pipe is fitted. As soon as the vessel is in motion, the negative pressure begins to exert itself, and increases proportionately with the speed of the vessel. All that now remains to be done is to measure with precision this increasing negative pressure, whereby the increasing speed of the vessel is ascertained. This is effected by prolonging the smaller tube into a manometric case, on the plan used by Vidi in the construction of his aneroid barometer. Into this case is *inserted* the tube in which the sucking action takes place. The two ends of the case advance or recede according to the vacuum determined, and this vertical movement of the ends of the case is converted into a horizontal motion by means of a lever, and turns an index-point which marks on a dial the degree of velocity attained. It is almost useless to add, that these results may be turned to further advantage by the addition of a *totalisateur*, whereby the degree of velocity obtained after a given time may be arrived at.

In order to ascertain the velocity of currents in a river, &c., the tube must be immersed in the water, when the dial will show the velocity of the stream, which may be ascertained at any point of its depth by immersing the tube accordingly. Currents of air may be measured in the same manner; but when the double cone-shaped tube is used for this purpose, it should be made of larger dimensions, though always in the same proportions. The sucking action of the tube may be rendered more powerful by enclosing it in a larger tube, care being taken to place the front orifice or mouth of the inner tube in the plane of intersection of the two cones of the larger tube.—*Moniteur Industriel.*

## HOLM'S PATENT SCREW PROPELLER.

A curious change in the form of screw propellers has been made by Mr. C. A. Holm, of Cecil-street, Strand, who has patented his invention, and given the following description of it in his specification:

The object of this improvement is to supply a remedy against the long and well-known defects of the common screw propeller in its application to the propelling of vessels; these defects are the difficulties experienced by engineers in obtaining sufficient resistance in the fluid on the surface of the common propeller within the ordinary limits of the draft of water of vessels to be propelled, and particularly so in the application of the propeller to vessels having to contend against head winds and sea, and also to what is called full power vessels. The screw propeller has, it may be said, in the present stage of the invention, only been successfully applied as an auxiliary to sailing-vessels, and has either failed or been rejected for high speeds, such as are required for the mail service on long voyages; but independent of the inadequate resistance of the common propeller, it has another great defect, which causes it to waste, under the most favourable applications and circumstances at sea, a very large part of the motive power applied to work it. I have discovered that this great waste of power is caused by centrifugal discharge of a great portion of the fluid called "slip" * at the circumference of the propeller in a line perpendicular to its axis. Now my invention is such, that by a peculiar construction of the surface of the propelling instrument, I am enabled to direct and discharge the fluid called "slip" in a line parallel to the axis of the instrument, or nearly so, and by means of which the power consumed in generating the centrifugal slip becomes available for the purpose of propelling the vessel.

The character of my invention may be said to be an improvement on the ordinary screw propeller, whatever may have been the mode adopted to determine the pitch uniform, or increasing either in the direction of the axis or in the direction of the radius; and my said improvements consist in the application of curved flanges forming part of the propelling blade; these curved flanges are placed on two sides of each blade; that is to say, one of them is placed at the circumference, and the other is placed at the sternmost edge of the blade, in the

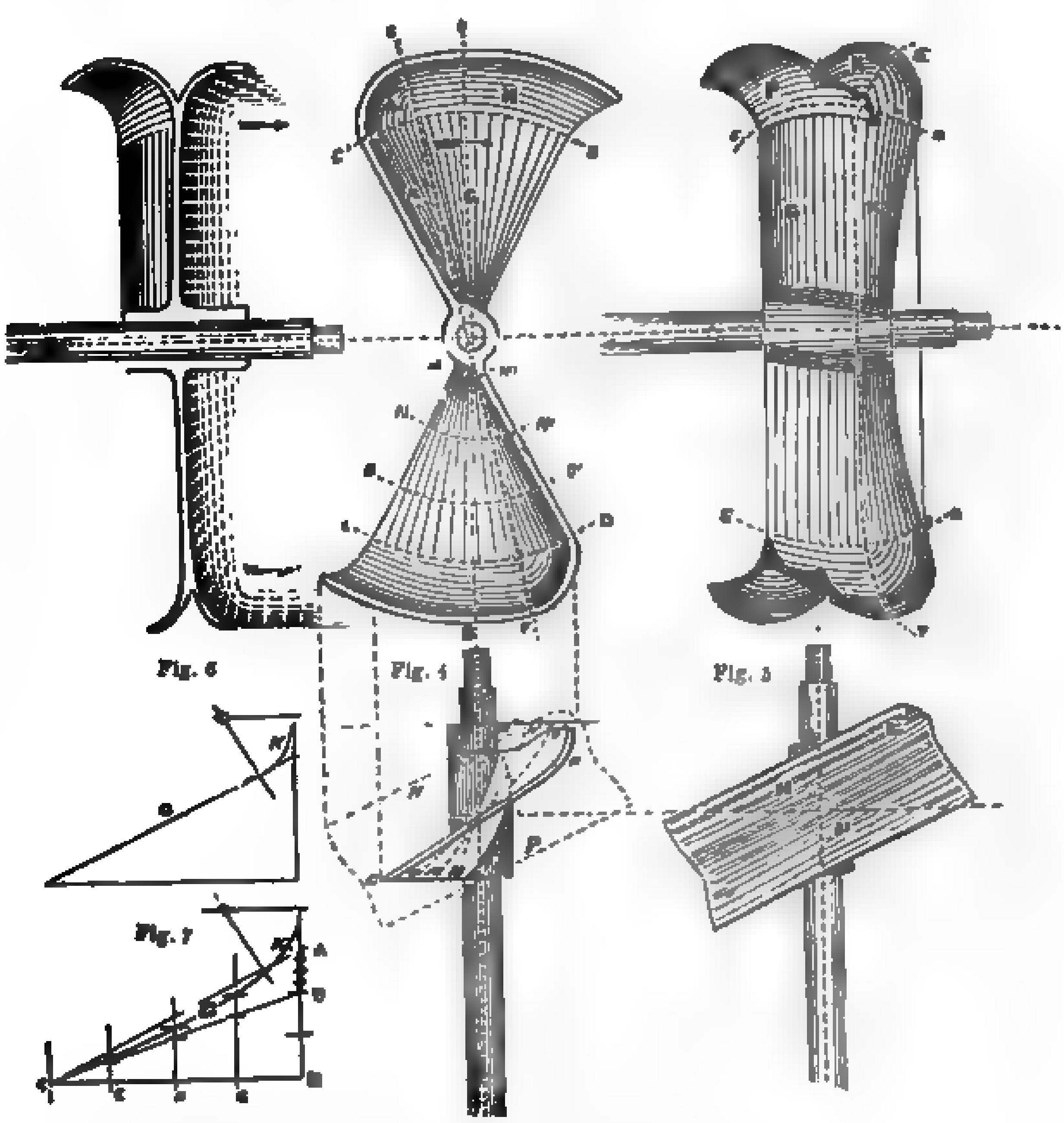
* We need scarcely remind our readers that this is an error. The term "slip" is never applied to a quantity of fluid, but to a difference of velocities. —Ed. M. M.

direction of the radius; but in order that these two curved flanges shall not form a sharp corner at the point where, if extended, they should meet, I unite them by a curve, which is a portion of a hollow sphere, or any other curved cavity, which would efficiently unite the two curved flanges, so as to form a spoon-shaped cavity in the sternmost corner of the propelling blade; and thus, by the combination of these curved flanges, I am enabled to direct or discharge the propelling current in a line parallel to the axis of the instrument, or nearly so.

In addition to the above-mentioned flanges, I further apply to the back of each blade another curved flange, but only at the circumference, and in an opposite direction to the above-mentioned flange, by means of which the instrument becomes useful for the purpose of backing the vessel.

By the increased resistance in the fluid, more motive power may effectively be applied to the working of my propeller; hence greater speed may be obtained than that realised either by screws or paddle-wheel; and with an equal expenditure of motive power the new propeller will give greater speed to the vessel, with a smaller number of revolutions of the propeller shaft, and would further admit of propelling vessels with smaller draught of water than hitherto, and would be also applicable to

Fig. 2. Fig. 1. Fig. 3.



vessels navigating on rivers and canals; from the circumstance of the propelling current being delivered in a line parallel to the axis, instead of perpendicularly, no risk would be incurred in destroying the banks of the canals.

My improved propeller may, as the ordinary propeller, be made of more than two

blades; but I will only describe one of those blades, in order that the different form of the different parts or portion of each blade may be more clearly understood separately from each other. I will therefore divide each blade into five distinct parts, each being of a form geometrically different from the other, and only one of these parts having the form of what is known as the ordinary screw propeller blade.

Fig. 1, is a front view of a propelling instrument with two blades. Fig. 2, a section through the line A—B, taken at right angles to the surface. Fig. 3, a side elevation or projection of the curves. Fig. 4, a section of the blade taken through the line C, D. Fig. 5, an end view of the blade; the same letters have reference to similar parts in all the figures. In figs. 1 and 3, I have drawn the lines C D, and E F, in order to be able to explain as above mentioned, separately from each other, the different form of the different portions of which the propelling instrument is composed; the part G, is a portion of a common screw propeller, to which I have added a screw curve, H, which I call the centrifugal curve. This centrifugal curve is generated by a quarter of a circle, the radius of which is one-fifth part of the radius of the exterior diameter of the propeller; this quarter of a circle, when united with the radius of the part G, forms the generatrix, by which the helicoidal surface of the instrument is composed; and the part G and H, when united, may either be of an uniform pitch, or have an increasing pitch, or have an expanding pitch, that is to say, a reduced pitch near the shaft equivalent to the amount of slip produced by the circumferential part.

Now whatever may be the construction of these parts I further add to them a lateral curve K, which are also portions of a circle; these lateral curves united by the centrifugal curve H, would form a curved flange round the circumference, and at the same time on the sternmost edge of the blade G; but in order that these two curves shall not represent a sharp corner at the point where, if extended, they would meet, I unite them by a third curve, L, which is a portion of a hollow sphere of the same radius as the centrifugal curve; these three curves should, when united with the screw blade G, form a perfectly smooth surface, and the rise of the curves should be such as to deliver the propelling current in a line parallel to the axis of the instrument, or nearly so, though the lateral curves K, may be gradually diminished towards the centre of the shaft where the instrument has little or no propelling power; this diminution of the lateral curves K, is shown in figs. 3 and 4; the lines M, M', N, N', and O, O', in fig. 1, are shown by corresponding lines and letters in fig. 4, representing the variation of the angles combined with the lateral curve.

The increased action that takes place on the instrument when it revolves would easily be understood by considering the increased resistance offered by the lateral curve to the escape of the fluid through or between two of such instruments, and by means of this resistance a portion of the fluid lodged in the cavity formed on or in the instrument by the different curves causes such portion of the fluid to revolve with the instrument, when the centrifugal force or momentum of the mass of fluid so revolving would operate and give out its power partly on the lateral curves, but more especially on the centrifugal curve, and the centrifugal power of the current would by that means be delivered in a line parallel to the axis of the instrument, and in an opposite direction to the axial motion of the propeller, as shown in section at fig. 2.

The description now given would make a very effective instrument for propelling the vessel forward, but would have little or no effect in propelling the vessel astern, or, as it is termed, backing. I have, therefore, applied to the back of the instrument a backing screw curve P, shown in figs. 2, 3, and 5, of the same pitch and radius of curve as the centrifugal curve H. The screw blade G, may also, for the purpose of backing, be extended in a straight line, or only be slightly curved; but I believe the form shown in the drawing would be most effective for the purpose. The dotted lines in fig. 4 represent the extent that the centrifugal curve and backing curve would assume when united to the instrument, and this is further shown in the exterior view of fig. 5.

Fig. 6, is a diagram showing the triangle of the development of one blade, if extended to the circumference, and of an uniform pitch combined with the lateral curve K, in such a manner that the hypothenuse of the triangle on the one part, and the perpendicular on the other, shall at the same time form tangents to the lateral curve.

Fig. 7 is a diagram showing the triangle of the development of one blade, if extended to the circumference, and of an increasing pitch combined with the lateral curve, K, of which the perpendicular of the triangle on the one part, and the line representing the increasing pitch, or, as is termed, curved directrix, on the other, forms at the same time tangents to the lateral curve; this curved directrix should, in order to be most effective, be a parabola; that is to say, it should accelerate the particles of fluid to be put in motion in the same manner as the acceleration of a falling body; thus, if the triangle A B C, represent the deve-

lopment of the circumference of one blade, of which A B is the pitch corresponding to the portion of the pitch employed, I set off from the point A, a portion of A B, equivalent to the amount of slip, say one-third of A B, then A D will represent the slip, and the triangle, B, C, D, the propelling wedge at the circumference of the instrument. Now if the base, C, B, of the triangle be divided in four equal parts by the perpendicular lines, E, F, and G, I divide A D, in a number of divisions corresponding to the square of the number of divisions of the base of the triangle; that is, the square of four divisions equal to sixteen divisions of the line, A D; and from the points where hypothenuse, D, C, intersects the lines, E, F, and G, I set off for the rising curve on the line E, $\frac{1}{16}$th part of A D; on F, $\frac{4}{16}$th of A D; and on G, $\frac{9}{16}$th parts of A D; and I draw through those points horizontal lines, and in the intersections of those lines with the lines, E, F, and G, I draw the curve which forms a directrix that will accelerate the particles of fluid to be put in motion in the ratio of the square of the number of divisions on the base of the triangle respectively, and the directrix is further completed with or by the lateral curve, K, as shown and described. These two diagrams would be useful in constructing templates or guide plates for the moulding or making of patterns for the instrument, and similar templates may also be constructed for any other part of the radius on the principle described. I should remark, that though I prefer the curved directrix for the construction of my propeller as being the best means of preventing vibration of the stern of the vessel, I do not always apply it to the whole extent of the surface, as shown in the diagram, but only partly to the entering edge of the blade; thus, if the pitch be more than $1\frac{1}{4}$ to $1\frac{1}{2}$ times the diameter of the propeller, I only apply the parabolic directrix to the extent of $\frac{1}{3}$rd or $\frac{1}{2}$ of the surface from the entering edge of the blade of the parts, G and H, and then the pitch would afterwards continue to be uniform until it reaches the point where it is to be united with the lateral curve; and this increase would be sufficient, as the object of the diminution of the pitch at the entering edge is only to prevent such entering edge of the blade from striking the water too suddenly, by which it would rebound from the instrument. I should further observe, that the pitch should, in order to be most effective, not be more than double the diameter of the propeller.

When the propeller is made with more than two blades, the total area of the projection of such blades should not exceed one-half the area of the entire disc; and in some cases, when it is desirable to multiply the number of blades, I unite them by means of portions of a cylinder, which portions of a cylinder may have the same breadth, or nearly so, as the breath in the line of the axis of the propelling blades.

I should further remark, that I do not limit myself to the precise proportion of the centrifugal or other curves described; and though I have found $\frac{1}{6}$th and $\frac{1}{4}$th of the radius of the propeller to answer for the radius of the centrifugal and backing curves, I think that the radius of such curve should not exceed $\frac{1}{3}$rd, nor be less than $\frac{1}{6}$th of the radius of the instrument; the propeller to be fitted to the stern of the vessel to be propelled, or to any part of the vessel on the plans known to be effective, and worked by steam, caloric, or other motive power. One of the advantages claimed for this propeller is that of effectually propelling the vessel on a smaller draught of water, or with a propeller of smaller diameter, and the limit of the reduction of the diameter would depend in a great measure on the form of the vessel to be propelled; but, as a general rule, the diameter should not be less than that which would produce a greater slip than thirty-three per cent. in calm weather.

## ROWLAND'S PATENT LABEL DAMPER.

In order to contribute towards the removal of the evils arising from the general use of adhesive stamps and gummed tickets, upon which we remarked on page 517 of our preceding volume, Mr. Owen Rowland has invented and patented a simple and cheap apparatus, which is now being brought before the public by the eminent firm of Messrs. S. Mordan and Co., of the City-road. It consists of a small vulcanized India-rubber vessel (or a vessel made of any other flexible material), with a piece of sponge, fixed in a holder, inserted in the mouth of the vessel, so that when the latter is squeezed or compressed in the hand, and the neck inserted in water, it fills itself in a few seconds; and whenever, by use or otherwise, the sponge becomes too dry, the vessel is to be gently pressed, and water will be gradually and perceptibly forced into the sponge, the apparatus at the time being held with its orifice upwards. On withdrawing the pressure the water returns into the vessel, leaving sufficient moisture in the sponge for damping purposes. The damper may be left in any position when not in use, as the water will not of itself run out.

The apparatus is also adapted for absorbing liquids in surgical cases, and for damp-

ing copying paper; also for cleaning fine painting, mirrors, &c., as the water is doubly filtered, and therefore free from grit, &c. It would also be found very serviceable for use in schools where slates are used. It is to be hoped that such a combination of utility, simplicity, and cheapness will ensure the success of the invention.

## PRINTED COPIES OF SPECIFICATIONS OF PATENTS.

Our readers are aware that by clause 30 of the New Patent Law Amendment Act the Commissioners of Patents are required to cause copies of all specifications of new patents to be printed and published "as soon as conveniently may be after the filing thereof." In pursuance of this requirement, the Commissioners have informed the public, that such printed copies of specifications would be obtainable at the Queen's printers three weeks after their being filed. But very great, and often extremely inconvenient departures from this arrangement have occurred. We have reason to know that application has been made for copies of many specifications, which have been filed for months, when not one could be obtained.

We believe that every effort has been made by Mr. Woodcroft and Mr. Edmunds to have the copies issued in proper time, and that the delays have not arisen in the Commissioners' office. We may now look for a speedy change, for we learn that after the end of the present month the publication of the printed copies of specifications will take place at the office of the Commissioners, and that new arrangements will be entered into in order to comply far more strictly than heretofore with the requirements of the Act. Should delays still occur, the Commissioners will have to become their own printers.

## LEE'S PATENT IMPROVEMENTS IN THE MANUFACTURE OF BRICKS AND TILES.

*To the Editor of the Mechanics' Magazine.*

Sir,—In your paper of the 8th instant appears a notice purporting to be an abstract of my specification as filed, for improved methods for producing the above. You say, "The second part of this invention consists in drying or burning the same, by the application of surcharged steam." Instead of which it should have been stated *by the application of* Hydrocaloric. Many of your intelligent readers will readily distinguish between the two elements. The chemist will at once perceive that bricks, &c., have always been *dried*, fired, or viturated by the application of caloric (whichever term may be preferred); and this portion of my principle consists in the production of that element at a cost comparatively nominal to that of the present wasteful and irregular system, on which no reliance can be placed; whereas, by my process, the manufacture can be carried on as well in December as in July, being wholly free from the influence of weather; and perhaps the most surprising part of the method is, that the clay from its raw state is converted into bricks within ten hours from the first, and ready for use when cold enough, while the quality is superior to those fired by the established practice (as I can produce proof), where made from the same material. Say it stands thus:—Old or established method, under *favourable circumstances, 15s. per thousand;* under my patent, and irrespective of weather, *5s.* per thousand. The time occupied by the established practice is an average of three weeks; by my method, as stated, only ten hours. I am, Sir, yours, &c.,

T. V. Lee.

Prospect-cottage, Lordship-lane,
July 17, 1854.

[Our correspondent is quite wrong in two of his statements; he first misquotes our abstract, and then contradicts his own specification. What we really said was, the invention has reference to certain arrangements, "secondly, for firing or burning the same" (viz., bricks and tiles) "by the application of the heat of surcharged steam." To establish the accuracy of our own abstract, and the nature of the patentee's statements, we add the following *literal* copy of the second claim, taken from the specification he has filed at the office of the Commissioners of Patents; it is "The application of hydrocaloric, *or the heat of surcharged steam* to the burning or firing of bricks, tiles," &c.—Ed. M. M.]

## IMPROVEMENTS IN PHOTOGRAPHY.

At a *conversazione* at the Polytechnic Institution, on Thursday, a curious illustration was given of the capabilities of photography in experienced hands. Two photographs were exhibited, one the largest, and the other the smallest ever produced by the process. The first was a portrait the full size of life, and the last was a copy of the front sheet of the *Times* on a surface scarcely exceeding two inches by three. Both pictures were exceedingly perfect, the portrait

being more pleasing and far more correct than those usually produced, while the copy, notwithstanding its exceeding minuteness, could be read without the assistance of a magnifying glass. The photographs were exhibited by Mr. Mayall, the well-known artist of Regent-street, and excited considerable interest during the evening.

## MORSE'S TELEGRAPH PATENT.

The Commissioner of Patents has extended the patent of Professor Morse, dated June, 1840, for seven years. The eighth claim of Prof. Morse's patent, which was decided by the U. S. Supreme Court to be illegal, has been disclaimed, and the patent renewed, according to that decision. It has been stated that the extension met with strong opposition from parties interested in the House and Bain patents, but of this we have not yet any positive evidence.—*Scientific American.*

## CLEATS FOR THE RUNNING RIGGING OF BOATS.

*To the Editor of the Mechanics' Magazine.*

Sir,—A good deal of attention has lately been directed to the use of an eccentric-sheaved cleat for holding the sheets and other running rigging of sailing boats. To show that this is not a new idea—though it appears that a Mr. Saxby has patented it—I beg to refer your readers to No. 1208 of your Magazine for October 3, 1846, where a description will be found of the eccentric cleat and a drawing annexed.

I am, Sir, yours, &c.,
J. M.

Temple, July 18, 1854.

## "THE ERICSSON."

The fame of Gotham is historic,
Her sons have built a ship caloric,
Which would not "go a-head" at all,
But sank near Jersey in a squall.
The Gothamites, with might and main,
Will try to get her up again;
Some strong steam tugs with derricks on
Will raise the humbug Ericsson.
They'd better leave her where she is—
She aint worth nothing when she's riz!

*From a Contemporary.*

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Collette, Charles Hastings, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of sugar.* (A communication.) Patent dated January 2, 1854. (No. 1.)

The inventor introduces the saccharine juices and the lime together into the defecating pan, and as soon as the lime has produced the requisite effect upon the liquid, adds, for the purpose of neutralising the lime, a sufficient quantity of super-phosphate of lime; usually in the proportion of about three parts of the latter to 100 parts of the juice. The mixture is then filtered and concentrated to 18° Baumé, and super-phosphate of lime is again added. The process of crystallization is then allowed to proceed, and the residual juices are re-treated, and so on.

Gowans, James, of Edinburgh, Scotland, contractor and builder. *Improvements in apparatus for heating and ventilating, and in baths and washing apparatus connected therewith, applicable to dwelling-houses.* Patent dated January 2, 1854. (No. 4.)

*Claims.*—1. The adaptation and application to the back of kitchen grates or ranges of a heat chamber into which the cold air may be admitted by an inlet or flue, and after being made to pass through the same in the course described, may be discharged at an outlet or flue, and conveyed to any required part of the building. 2. The combination of a bath with the boiler of the kitchen range.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Certain improvements in water-wheels.* (A communication.) Patent dated January 2, 1854. (No. 7.)

This invention consists in constructing water-wheels with suspended paddles in such manner that the paddle on rising, after passing the vertical, is prevented from carrying up with it part of the water in which it is immersed; "as is the case," says the inventor, "in ordinary wheels."

Corlett, Henry Lee, of Summer-hill, Dublin, gentleman. *Improvements in caoutchouc springs for locomotive engines and tenders, railway carriages and wagons.* Patent dated January 3, 1854. (No. 8.)

The first of these improvements consists in perforating with a number of holes or cells of any form a cylinder, or other convenient form of vulcanised or otherwise prepared caoutchouc, in the direction of the spring's action; and the second consists in forming castings for holding the perforated springs.

Madeley, Joseph, of Walsall, Stafford,

machinist. *An improvement or improvements in the manufacture of certain kinds of tubes, and in nuts for the heads of screws.* Patent dated January 3, 1854. (No. 9.)

The inventor rolls bars or rods of iron into the form of one half of the tube to be made, and takes two such bars, and places their concave sides together, and, after raising them to a welding heat, passes them between rolls, or draws them through a drawplate, or otherwise welds them together into a tube. To make nuts of the same sectional form, he cuts bars manufactured as described into short lengths.

KENNEDY, DAVID, of Reading, Pennsylvania, United States, manufacturer of leather. *An invention for the use of tanners, being certain compositions of matter to be used in the manufacture of leather.* Patent dated January 3, 1854. (No. 10.)

The composition described by the inventor, and which is intended to be used instead of lime for removing the hair from skins, "consists of fresh slacked lime 1 bushel, of fresh wood ashes 1 bushel, of sal-soda (also called carbonate of soda) 8 lbs., and sufficient water to mix these materials into a liquid of the proper consistency and strength, using one and a half bushels of this composition with the same quantity of water, and to perform the same duty for which two bushels of lime is ordinarily used."

STROVOLD, JAMES, of Barnes, Surrey, civil engineer. *Improvements in machinery or apparatus for sifting and washing gravel, or other similar substances.* Patent dated January 3, 1854. (No. 11.)

The inventor places the material to be operated upon in such a position as to ensure a constant supply of it to a perforated cylinder, which is placed in a sloping or angular position, and rotates so as to separate and deliver successively the coarsest or stony portion, the second, or next size, the smallest size gravel, and, finally, the sandy portion of the mass.

COLLINS, JOHN, of Saint Ann-street, Liverpool. *Improvements in the manufacture of vinegar.* Patent dated January 3, 1854. (No. 14.)

A full description of this invention will shortly be given.

GRYLLS, JOHN ISAIAH, of Murton-street, Sunderland. *An improvement in whelps for the barrels of capstans, windlasses, and other machinery.* Patent dated January 3, 1854. (No. 15.)

This invention consists in forming the projecting part of the whelp which the chain first comes against, and down which it slides, with a hollow between the two inclined sides, for holding the links of the chain cable.

MANN, THOMAS, of Horsham, Sussex, gentleman. *An improved cinder-sifting shovel.* Patent dated January 3, 1854. (No. 16.)

The body of this improved shovel is made with a plain solid frame, having an open centre, in which is fitted a panel of wire-net or straight wirework.

BERNARD, JULIAN, of Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and shoes, part of such improvements being applicable to the manufacture of garments.* Patent dated January 3, 1854. (No. 17.)

This invention consists—1. In modes of securing the uppers or fronts to the soles or bottoms of boots and shoes by attaching first a welt or strip to the upper before it is secured to the sole, or by attaching the welt first to a sole, or by splitting a sole along and around its edge and raising the edge so as to form a substitute for a welt, which may be connected by stitching or otherwise to the uppers. And it consists, 2. In certain methods of cutting out the parts of boots and shoes.

HULETT, DAVID, of High Holborn. *Improvements in gas regulators for regulating the supply of gas to the burner.* (Partly a communication.) Patent dated January 4, 1854. (No. 19.)

A full description of this invention will be given hereafter.

SCHISCHKAR, EDWARD, of the firm of James Ackroyd and Son, of Halifax, York, manufacturer, and FREDERICK CRACE CALVERT, of Manchester, professor of chemistry. *Improvements in dyeing and printing textile fabrics and yarns.* Patent dated January 5, 1854. (No. 22.)

*Claim.*—The imparting a bright lustrous or glossy appearance to the colours or fibres of fabrics or yarns by impregnating them with sulphates or oxides of copper, lead, or bismuth, and decomposing such sulphates or oxides by means of sulphuretted hydrogen.

WHITE, DAVID BLAIR, of Newcastle-upon-Tyne, doctor of medicine. *Improvements in the manufacture of waterproof fabrics, and of waterproof bags, and other like articles.* Patent dated January 5, 1854. (No. 23.)

This invention consists in applying to fabrics a compound which is insoluble in water, by means of resin dissolved in coal-tar, oil, or other suitable solvent, and of a metallic oxide, or of an alkaline earth, or of both, and either with or without the addition of India-rubber dissolved in naphtha or other suitable solvent, or of a solution of pitch and India-rubber.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in ventilating carriages and buildings, part or parts of such improvements being ap-*

*plicable to the obtainment of motive power.* (A communication.) Patent dated January 5, 1854. (No. 24.)

This invention mainly consists in a "mode of cooling, purifying, and removing dust and other foreign matters from the air employed in ventilating railway carriages and buildings by causing such air to be passed through a film or thin sheet of water, which is kept constantly flowing over any suitable perforated fibrous or porous material."

RIGBY, WILLIAM, of Glasgow. *Improvements in steam hammers and pile-driving machinery.* Patent dated January 5, 1854. (No. 25.)

The inventor claims the use in those steam hammers in which the steam is used to raise them only, of a hammer-block, in the form of a ram or plunger, passing through stuffing-boxes in both ends of a cylinder, which plunger is of larger sectional area at the part which passes through the top gland than at that which passes through the bottom, so that on the steam being admitted into the cylinder, its pressure will act on the difference of the areas of the two ends, and will raise the ram to the required height; and on the steam being allowed to escape, the ram will fall by its own gravity, and will be guided by the cylinder and stuffing-boxes without the aid of guides above or below the cylinder, as heretofore used. And in those hammers in which the steam is used both to raise and depress the hammer, he claims a method of making the ram work through the bottom only, so that the top of the ram forms a piston for the steam to act upon, both in its ascent and descent.

POMME, LÉON JOSEPH, gentleman, of Paris, France. *Certain improvements in reducing the friction of axles and axletrees of carriages.* Patent dated January 5, 1854. (No. 26.)

This invention consists in substituting for the usual axle-boxes and bearings a frame formed of two side-plates, united at the top, and having between them two cylindrical rollers, which rest upon the journal of the axle. These are of a larger diameter than the axle, and serve as antifriction rollers. The frame is moveable, and causes the rollers to be in constant contact with the axle or axletree of the vehicle.

MASON, JOHN, of Rochdale, Lancaster, machinist, and LEONARD KABERRY, of Rochdale, aforesaid, manager. *Improvements in machinery or apparatus for preparing cotton, wool, and other fibrous materials for spinning.* Patent dated January 5, 1854. (No. 27.)

This invention is, in the first place, applied to narrow caps used for feeding condenser carding-engines, and consists in the application of such narrow caps, without central shafts, to the action of unwinding surfaces; and, in the second place, it has reference to that description of slubbing and apparatus known as Mason and Collier's, and consists in the application of a projecting part situated within the bobbin between its upper and lower ends, and bearing upon the spindle.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for crushing or grinding and washing and amalgamating quartz, rock, and other substances.* (A communication.) Patent dated January 5, 1854. (No. 28.)

This invention consists mainly of an annular trough formed of iron, and of one or more crushing-wheels placed in the trough, and held in position by an axle which is jointed to and turns on a centre pin, thereby steadying and supporting the edge-wheel in its place as it rolls round, and also allowing a sufficient rise and fall in the wheel in running over the quartz.

EDWARDS, HENRY HIND, of Ludgate-hill, London, civil engineer. *Certain improvements in treating peat and vegetable matters for the purpose of fuel, as well as in the extraction of other useful products therefrom.* (Partly a communication.) Patent dated January 6, 1854. (No. 30.)

This invention consists—1. In an apparatus to be used for desiccating, moulding, and purifying peat; and, 2. In an apparatus to be used in carbonising vegetable matters, consisting mainly of a metallic web or endless chain, on which the materials are to be placed, and thus exposed to the action of the heated air, being brought nearer and nearer to the source of heat as they approach the point at which they are discharged.

HEALEY, JOHN, of Bolton-le-Moors, Lancaster, engineer. *Improvements in spinning-machines, known as mules, and in machines of similar character.* (A communication.) Patent dated January 6, 1854. (No. 33.)

This invention relates to Sharp, Roberts, and Co.'s self-acting mules.

The first improvement applies to the cam or pulley employed to bring out the carriage, and it consists in using a cam shaped so as to bring the carriage from the rollers at such speed that the points of the spindles will recede from the nip of the rollers at one exact and uniform rate, which is not the case when the pulley or cam employed is cylindrical. By using this form of cam, the yarn or threads are to be uniformly stretched. The second improvement relates to the shaper or copying-rail, and it consists in hinging a portion of a rail moving vertically, so that the inclination may

be varied to give a proportional lowering to the fallers during the whole formation of the cop suited to its varying shape.

STIRLING, JOHN DAVIE MORRIES, of the Larches, Aston, near Birmingham, Warwick, Esq. *Improvements in the manufacture of iron.* Patent dated January 5, 1854. (No. 35.)

*Claims.*—1. The employment of chlorides, phosphates, and carbonates of metal, alkalies, and earthy bases, in the moulds or pig-beds of blast furnaces; and, 2. The employment of petroleum, bituminous, or tarry matter, resin, peat, and similar combustible matters in the pig-beds or moulds of blast furnaces in combination with the oxides.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the construction of motive-power engines, part of which improvements is also applicable to the packing of pistons generally.* (A communication.) Patent dated January 6, 1854. (No. 36.)

This invention mainly consists in constructing "a steam chest with continuous circular ports or passages, both for the induction and exhaust, arranged so as to keep a constant and equal pressure of steam upon both ends, and the periphery or outer surface of a cylindrical piston-valve, which travels in the bore of the same, and by which also is secured a large area of port by a very small movement of the valve."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for dyeing, washing, and bleaching fabrics.* (A communication.) Patent dated January 7, 1854. (No. 38.)

This invention consists in constructing a perforated tube, through the perforations of which the liquor is to be forced, and thus made to enter the body of the cloth, which is passed through the machine from one roller to another, and is caused to press tightly upon the surface of the cylinder. By the pressure put upon the liquor, it will, as it passes into the cloth, force out the globules of air contained in the pores of the cloth, and insure the perfect saturation of those parts which are exposed to the action of the liquor.

VON RATHEN, ANTHONY BERNHARD, Baron, of Wells-street, Middlesex. *Improvements in chimneys and flues of houses and in stoves to be employed therewith, whereby better draft will be obtained, consumption of fuel will be diminished, smoke, fog, and night-damp will be prevented from entering apartments, more warmth will be thrown out, and whereby fire in the chimney can be readily extinguished.* Patent dated January 7, 1854. (No. 39.)

*Claims.*—1. The construction of the grates of stoves and fire-places with perforated plates at the back and sides for the admission of air to the fire. 2. A mode of feeding stoves and fire-places from beneath. 3. The construction of chimneys and flues with a case or chamber over the fire-place or fire-places in connection therewith, and tubes leading from such case or chamber.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SMITH, EDWIN DALTON, of Hertford-street, May-fair, Middlesex. *A mode of communication between the passengers, guards, and engineer of a railway train.* Application dated January 2, 1854. (No. 2.)

In carrying out this invention, a spiral spring, with a rack attached to the top of it, is fastened to a bar of iron or a tube, which by being drawn in, moves the tongue of a hammer, and so strikes the bell which is fixed to the engine or carriage; the tongue having a hinge, then allows the rack to return to its proper place.

DAWSON, ALFRED, of Barnes-place, Stepney, Middlesex. *Converting small coal or coal-dust, or small coal and coke, into solid blocks of fuel.* Application dated January 2, 1854. (No. 3.)

This invention consists in mixing small coal and water, or coal, coke, and water, in confining the same in iron moulds that are air-tight, or nearly so, and in exposing them to heat and pressure, in order to combine them.

MONTEL, PIERRE AMBROISE, engineer, of Paris, France. *Certain improvements in stopping the trains on railways.* Application dated January 2, 1854. (No. 5.)

The inventor proposes to raise the carriages, and cause them to be borne by supports resting and sliding upon the rails. The carriages are to be raised by their own momentum, by means of pulleys fixed on the axles of the wheels, and endless straps or bands.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury, London. *Improvements in dyeing wool.* (A communication.) Application dated January 2, 1854. (No. 6.)

This invention consists "in dyeing wool after combing, without being obliged to unwind the wool to put it in skeins before the dyeing operation, and to wind it up again on the bobbins after the dyeing; the operation of dyeing being carried on by the usual method."

BEAUREGARD, FELIX ALEXANDRE TESTUD DE, civil engineer, of Paris, France. *Improvements in drying cigars and ligneous materials or other substances.* Application dated January 3, 1854. (No. 12.)

The cigars are placed on a grating or network in a box above a tray containing

powdered chloride of calcium, or perchloride of iron, or other substance having a great affinity for water. A few sheets of blotting paper are placed in the bottom of the tray to absorb the moisture, and the box is covered by a lid. The moisture contained in the air in the box is absorbed by the chloride of calcium, or other hygrometric substance, and the air takes up the moisture from the cigars, which are thus quickly dried.

WILLSON, EDWARD JOHN, of Oxford-street, Middlesex, naturalist. *An improved method of making portfolios, music-books, brief-cases, and pocket-books.* Application dated January 3, 1854. (No. 13.)

After the covers are prepared, several elastic bands composed of silk, cotton, and India-rubber, are inserted by the inventor about an inch from the outer edge on the outside of the cover, and by these the back is made to expand or contract; and the inside or flap, made of bookbinder's cloth, or leather, is so fixed as to form a back when drawn out, and thus assists in preventing the contents from falling out.

DRANSFIELD, JOHN, of Oldham, Lancaster, hat-manufacturer, and WILLIAM ROBINSON, of the same place, cotton-spinner. *Certain improvements in carding cotton, wool, and other fibrous substances.* Application dated January 3, 1854. (No. 18.)

These improvements consist mainly in the application of combs, having the teeth curved, to the "taking-in" roller or rollers, or to the main carding cylinder or cylinders.

TAYLOR, JOHN, of Oldham, Lancaster, cotton-spinner; MILES WRIGLEY, of same place, carder; and SAMUEL GREAVES, of same place, carder. *Certain improvements in carding-engines for carding cotton, wool, and other fibrous substances.* Application dated January 4, 1854. (No. 20.)

These improvements consist in applying one or more revolving "clearers," or card-rollers, in contact with or below the "licker-in" or "taker-in" roller, so as to revolve with it, and act as dirt-extractors.

LIDDIARD, JOSEPH, of Deptford, Kent, architect and surveyor. *Improvements in the construction of furnaces, with a view to the prevention of smoke.* Application dated January 5, 1854. (No. 21.)

This invention consists—1. In employing curved furnace bars, and—2. In the introduction of two or more jets of cold or heated air in pairs at a suitable height above the bars or grate, and opposite each other.

PEARSE, ISAAC, of Cawsand, Cornwall, pilot. *Improvements in means for navigating ships or other vessels.* Application dated January 6, 1854. (No. 29.)

The inventor constructs an instrument formed of a portion of a sphere with a brass or other meridian compass-card, &c., attached to it, to be used in great circle sailing.

TAIT, ROBERT, of Glasgow, Lanark, North Britain, merchant. *Improvements in the manufacture or production of ornamental fabrics.* Application dated January 6, 1854. (No. 31.)

In this invention fabrics of the zebra class are woven by means of any suitable figure-working machinery, with one side flushed or back-lashed, whilst the other side has a pattern or device thrown up upon it by the weaving action. This latter surface is afterwards printed with the desired pattern or ornament.

RADCLIFFE, JOHN, of Stockport, Chester, machinist. *Certain improvements in power-looms for weaving.* Application dated January 6, 1854. (No. 32.)

This invention consists in the employment of elastic surfaces in certain parts of power-looms, for the purpose of adjusting, regulating, and reducing the impulsive action of the "picker" instead of the "check-strap" or other contrivance hitherto employed.

POOLE, MOSES, of Avenue-road, Regent's park, Middlesex. *Improvements in the manufacture of dextrine, glucose, and alcohol, and in employing the products of such manufacture.* (A communication.) Application dated January 6, 1854. (No. 34.)

This invention consists in manufacturing the above materials from saw-dust, shavings, spent dye-wood, the pulp of beet-root which has been used in the manufacture of sugar, potatoes, &c., rags, &c., &c.

ASPDEN, WILLIAM, of Blackburn, Lancashire, overlooker of power looms. *Certain improvements in looms for weaving.* Application dated January 7, 1854. (No. 37.)

The inventor attaches a small spring to the under part of each end of the slay board of the loom, and to this spring joins one end of a small chain, which runs through a slot or groove in the slay board, the other end of it being attached to a small moveable boss or knot, which is on the picker-spindle of the loom.

ROSS, JESSE, of Keighley, York, gentleman. *Improvements in making compounds of chocolate, cocoa, and other ingredients, for breakfast and occasional beverages.* Application dated January 7, 1854. (No. 40.)

The inventor mixes cocoa, chocolate, coffee, and chicory, differently combined, and in various proportions which he enumerates.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for effecting agricultural operations, and in communicating power thereto, parts of the said improvements*

*being applicable to the obtainment of motive power for general purposes.* (A communication.) Application dated January 7, 1854. (No. 41.)

These improvements mainly consist in certain modifications of the agricultural machinery patented by the patentee on the 10th of May, 1853.

CARALLI, NICHOLAS MICHAEL, of Glasgow, Lanark, merchant. *Improvements in the manufacture or production of ornamental fabrics.* Application dated January 7, 1854. (No. 42.)

In carrying out this invention, a plain twilled or other fabric is used as the material for producing a duplex pattern, no flushing or back lashing being used. This fabric is printed by any known means "in the zebra or a similar style on each side, so that the piece answers the end of showing two dissimilar styles of ornamentation."

TAYLOR, JOHN GEORGE, of Glasgow, Lanark, North Britain, merchant. *Improvements in writing apparatus.* Application dated January 7, 1854. (No. 43.)

This invention relates mainly to a novel arrangement of ever-pointed pencil or adjustable writing or marking instrument, the main shell or barrel of which is of tubular metal, and has an external spiral groove formed upon it.

EDWARDS, HENRY SUTHERLAND, of Paris, France, gentleman. *Improvements in preparing textile fabrics or materials for the purpose of their better retaining colours applied to them.* (A communication.) Application dated January 7, 1854. (No. 44.)

This invention consists in passing textile fabrics through a bath consisting of water holding in solution alum, sulphate of zinc, protochloride of tin, caustic potash, and nitric acid, or other similar materials.

## PROVISIONAL PROTECTIONS.

*Dated May* 2, 1854.

979. Thomas Jackson, of Commercial-road, Pimlico, Middlesex, contractor for public works. Improvements in the manufacture of paper from flax, hemp, jute, Indian grass, and other fibrous vegetable substances, or the tow produced from such fibrous substances.

*Dated May* 31, 1854.

1210. Léon Isidore Molinos, civil engineer, and Charles Pronnier, civil engineer, both of Paris, France. Improvements in locomotive steam engines.

*Dated June* 22, 1854.

1366. William Stidolph, machinist, of Wintoun-place, Greenwich, Kent. A transferable bookmarker.

1368. George Simpson, of Union-buildings, Leather-lane, Holborn. Improvements in furnaces.

1370. William Henry Brown, of Wardsend Steel-works, near Sheffield, York, steel roller and manufacturer. An improvement in the construction of furnaces for the melting of steel and other metals requiring a crucible in the melting thereof.

1372. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain new and useful improvements in machinery for forging or hammering iron, which may be also applicable to the hammering of other materials. A communication.

1374. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in grate-bars, and certain appliances to the same, for the purpose of preventing them from warping or twisting by heat. A communication.

1376. Astley Paston Price, of Margate, Kent, chemist. Improvements in the treatment of certain alloys of tin.

1378. Godfrey Ermen, of Manchester, Lancaster, cotton-spinner. Certain improvements in machinery or apparatus for winding yarns or threads.

*Dated June* 23, 1854.

1380. Charles Phillips, of Offchurch, Warwick, engineer. The improvement of apparatus or machinery for reaping.

1381. David Clovis Knab, of Rue Rosini, Paris, France, operative chemist. Certain improvements in the production of carburets of hydrogen.

1383. Auguste Edouard Loradoux Bellford, of Castle-street, London. An improvement in propelling vessels in water. A communication.

1385. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in machinery for picking or opening cotton and other fibrous materials, and all kinds of waste rags and old materials, to prepare the same for the operation of carding, or for other operations. A communication.

1387. John Weild, of Glasgow, Lanark, marine surveyor. Improvements in preventing the drainage waste of cargoes on ship-board.

1388. John Keyse, of Apollo-buildings, Walworth, Surrey, gentleman. An improved method of loading muskets, rifles, carbines, pistols, and all descriptions of small arms with cartridge, without applying the cartridge to the mouth.

1389. Thomas Isaac Dimsdale, of Hadley, Middlesex, gentleman. An improvement in the manufacture of gas for lighting and heating purposes.

1391. Richard Garrett, junior, of Leiston Works, near Saxmundham, Suffolk, engineer. An improved arrangement of valves for working steam expansively.

*Dated June* 24, 1854.

1393. Henry Lightbown, of Pendleton, Lancaster, paper-stainer. Improvements in drying pulp in the manufacture of paper, also paper-hangings and printed textile fabrics.

1395. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. A new or improved projectile for ordnance and small arms, and a sabot or plug to be employed therewith, which sabot or plug may also be used with other projectiles. A communication from W. Antrobus Holwell, of Quebec.

1397. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved mill for grinding and pulverizing paints and various vegetable and mineral substances. A communication.

1399. John Thomson, of Newton-le-Willows, Lancashire, sugar-refiner. Improvements in centrifugal apparatus used in the manufacture of sugar.

1401. Reuben Bottomley, of Rochdale, Lancaster, cotton-spinner, David Schofield, of Oldham, same county, mechanic, and Henry Spencer, of Rochdale, manager. Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.

*Dated June* 26, 1854.

1403. Emile Hubner, of Mulhouse, France, en-

gineer. Improvements in machinery for preparing wool, cotton, silk waste, tow, and other fibrous materials.

1407. William Palmer, of Sutton-street, Clerkenwell. Improvements in candle-lamps.

1409. Thomas Hill Bakewell, of Welford-road, Leicester. Improvements in the manufacture of gloves.

*Dated June* 27, 1854.

1411. William Brindley, junior, of Moorgate-street, London, general trader. Improvements in the construction of life-boats.

1413. Charles Hastings Collette, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of beer. A communication.

1415. Richard Leicester Antrobus, of Birmingham, Warwick, commercial clerk. A new or improved method of printing oil-cloth for floor and table-covers, paper hangings, and other surfaces.

1417. Charles Iles, of Peel Works, Birmingham, manufacturer. Improvements in metal bedsteads.

1419. Peter Armand Lecomte de Fontainemoreau, of South street, London. Improvements in apparatus for producing aerated waters. A communication.

*Dated June* 28, 1854.

1421. James Brunlees, of Manchester, Lancaster, civil engineer. Improvements in drawbridges applicable to rail and other roadways.

1423. Edmund Cockshutt, of Preston, Lancaster, ironfounder. Improvements in bungs or adjustable stopper apparatus for casks and other vessels.

1425. Theophile Schlœsing, of Paris, France. Improvements in the manufacture of carbonates of soda.

*Dated June* 29, 1854.

1427. William John Bisseker, of Birmingham, Warwick, manufacturer. A new or improved method of labelling bottles and such other vessels or articles as require or may require labelling.

1428. Corydon Stillman Sperry, of Connecticut, United States of America. An improved knitting-machine. A communication from William M. Chase, of Boston, Massachusetts, United States of America.

1429. Thomas Markland, of Hyde, Chester, warp-dresser. Certain improvements in machinery or apparatus for warping, dressing, and weaving textile materials.

1430. William Smith and William Bramwell Hayes, both of Manchester, Lancaster, manufacturers. Certain improvements in power looms for weaving.

*Dated June* 30, 1854.

1431. Edward Joseph Hughes, of Manchester, Lancaster, patent-agent. Improvements in sewing-machines. A communication.

1432. John Edwards, of Manchester, Lancaster, gentleman. Improvements in railway chairs.

1433. Daniel Towers Shears, of Bankside, Southwark, Surrey. Improvements in curing or separating moisture from sugar and other substances. A communication.

1434. Laurent Furcy Izart, manufacturer, of France. A new mode of removing organic vegetable substances from woollen fabrics.

1435. Willoughby Theobald Monzani, of St. James's-terrace, Blue Anchor-road, Bermondsey. Improvements in the manufacture of folding chairs, stools, and other articles to sit or recline upon.

1436. Nathan Thompson, junior, of New York, United States of America. Improvements in regulating the supply of steam from steam boilers.

1437. Henry George Gray, of Commercial Wharf, Mile-end-road, Middlesex. Improvements in preserving potatoes, roots, plants, grain, and seeds.

1439. Thomas Slater, of Somers-place West, St. Pancras, Middlesex, optician, and Joseph Tall, of Crawford-street, Marylebone, in the same county, tool-maker. Improvements in the construction of planes, and in cutting-apparatus, and in the machinery employed therein.

1440. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for winding thread or yarns. A communication from Louis Joseph Nicolas Carpentier.

*Dated July* 1, 1854.

1441. Robert Lewis Jones, of Chester, railway-manager. Improvements in locks and keys.

1442. Joseph Hulme, of Manchester, Lancaster, engineer. Improvements in steam engines, and in valves, parts of which improvements are applicable for diminishing friction in other engines.

1444. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in submarine navigation. A communication from Messrs. Payerne and Lamiral.

1445. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in stoppers for bottles and other vessels, and in apparatus connected therewith. A communication from Hubert Bordet.

1446. George Hutchison, of Glasgow, Lanark, merchant. An improvement or improvements in the manufacture of soap.

1447. John Wilder, of the firm of James Wilder and Sons, of Reading, Berks, agricultural machinists. Improvements in agricultural rollers and clod-crushers.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1513. Paul François Aerts, of Brussels, Belgium, mechanical engineer. Improvements in constructing parts of railway rolling stock, and in the lubrication thereof. July 11, 1854.

1515. Thomas Frederick Henley, of Brompton, Middlesex, merchant. Improvements in the preparation of certain colouring materials. July 11, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July* 14*th*, 1854.)

533. David Barr. An improved combined hair-brush and comb.

551. Richard Boyell. A portable safety-guard for the prevention of fire, applicable alike both to public and private buildings, and which said portable safety-guard is also applicable as a reviver.

558. William Warne. Improvements in tubular steam boilers or generators.

565. William Beckett Johnson. Improvements in strengthening the ends of tubes to be attached to boiler-plates, or to be used for other such purposes.

584. Zephirin Boitteux. Certain improvements in the machinery for sculpturing and carving.

588. James Cooper Hall. An improved windlass.

597. John Buchanan. Improvements in the propellers and apparatus used for propelling vessels.

603. Edward Haeffely. Improvements in the manufacture of stannates of soda, potash, and ammonia.

619. Joseph Pimlott Oates. Improvements in the manufacture of bricks, tiles, pipes, and such other articles as are or may be made of clay.

635. John Gerard. Machinery for cutting and stamping soap.

641. George Harman Barth. Improvements in the mode of supplying and administering gases for the alleviation and cure of certain diseases.

668. John Polson. Improvements in the manufacture of starch.
979. Thomas Jackson. Improvements in the manufacture of paper from flax, hemp, jute, Indian grass, and other fibrous vegetable substances, or the tow produced from such fibrous substances.
1092. James Philip Baker. Improvements in the construction of railway and other bridges, and in the method of lifting the same after sinking.
1126. Henry S. Rogers. Improvements in firearms. A communication from Eli Whitney, of the United States of America.
1164. Joseph Harrison. Improvements in pianofortes.
1202. John Mac Farlane. Improvements in steam boilers.
1213. John Whitaker and James Pickles. Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, or other fibrous substances.
1280. Gustav Adolph Buchholz. Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.
1361. William Edward Newton. Improvements in apparatus for generating and utilizing steam. A communication.
1368. George Simpson. Improvements in furnaces.
1369. John Marriott Blashfield. Improvements in the manufacture of china, pottery, bricks, and other articles, manufactured for the most part of clay.
1372. Auguste Edouard Loradoux Bellford. Certain new and useful improvements in machinery for forging or hammering iron, which may be also applicable to the hammering of other materials. A communication.
1374. Auguste Edouard Loradoux Bellford. Certain improvements in grate-bars, and certain appliances to the same for the purpose of preventing them from warping or twisting by heat. A communication.
1376. Astley Paston Price. Improvements in the treatment of certain alloys of tin.
1377. Astley Paston Price. Improvements in the purification of tin, and in obtaining useful products arising from such purification.
1387. John Weild. Improvements in preventing the drainage waste of cargoes on ship board.
1391. Richard Garrett, junior. An improved arrangement of valves for working steam expansively.
1397. Richard Archibald Brooman. An improved mill for grinding and pulverizing paints and various vegetable and mineral substances. A communication.
1399. John Thomson. Improvements in centrifugal apparatus used in the manufacture of sugar.
1403. Emile Hubner. Improvements in machinery for preparing wool, cotton, silk waste, tow, and other fibrous materials.
1407. William Palmer. Improvements in candle-lamps.
1413. Charles Hastings Collette. Improvements in the manufacture of beer. A communication.
1414. Samuel Smith Shipley. Improvements in fittings suitable for dressing-cases, and for other purposes of elegance and utility.
1416. William Morgan. Improvements in machines for cutting paper, card, and mill-boards, woollens, veneers, and materials used in making paper, parts of which improvements are applicable to other machines where quick and slow motions are used, and where machinery is required to be thrown into and out of gear.
1417. Charles Iles. Improvements in metal bedsteads.
1419. Peter Armand Lecomte de Fontainemoreau. Improvements in apparatus for producing aerated waters. A communication.
1425. Theophile Schlœsing. Improvements in the manufacture of carbonates of soda.
1428. Corydon Stillman Sperry. An improved knitting-machine. A communication from William M. Chase, of Boston, Massachusetts, United States of America.
1433. Daniel Towers Shears. Improvements in curing or separating moisture from sugar and other substances. A communication.
1437. Henry George Gray. Improvements in preserving potatoes, roots, plants, grain, and seeds.
1439. Thomas Slater and Joseph Tall. Improvements in the construction of planes, and in cutting-apparatus, and in the machinery employed therein.
1444. John Henry Johnson. Improvements in submarine navigation. A communication from Messrs. Payerne and Lamiral.
1515. Thomas Frederick Henley. Improvements in the preparation of certain colouring materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

A petition has been presented to the Attorney-general for leave to disclaim a portion of and amend the title and specification of letters patent granted to Peter Fairbairn, of Leeds, Yorkshire, machine-maker, for "Improvements in machinery for heckling, carding, drawing, roving, and spinning flax, hemp, tow, silk, and other fibrous substances." Dated October 26, 1848.

## WEEKLY LIST OF PATENTS.

*Sealed July* 14, 1854.

113. Bevan George Sloper.
122. Charles Howard.
127. Joel Spiller.
149. John Westerton.
170. Peter Armand Lecomte de Fontainemoreau.
185. Edward Batten Walmsley.
238. Louis Christian Koeffler.
239. Louis Christian Koeffler.
251. William Guest.
282. Edwards Cole.
310. John Dalton.
336. Gregory Bird.
568. John Holley Swan.
610. Albert Wentworth Conner.
611. John Holley Swan.
786. George Francis Wilson and James Monroe Whiting.
964. John Evans.
1004. William Exall.
1084. John Chedgey.

*Sealed July* 18, 1854.

135. Charles William Rowley Rickard.
136. Henry Dircks.
148. George Grace and Thomas Francis Jones.

153. Peter Spence.
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408. John Ramsbottom.
418. John Henry Johnson.
1006. Edwin Haseler.
1056. Josiah Penton and James Mackay.
1071. Alfred Vincent Newton.
1085. William Edward Newton.
1104. James Horsfall.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*I. G.*—We regret that we are not able to furnish satisfactory answers to either of your questions. There is, however, no doubt that vessels capable of being folded and removed easily, when collapsed, would answer best for the description of pontoon mentioned.

*R. N., Birmingham.*—We shall probably publish a description of the Patent you refer to in the course of a few weeks.

*Engineer, Manchester.*—Your letter will be inserted.

*E. Cocks, Southampton.*—Thanks for your letter, &c.; we shall shortly take notice of your suggestion.



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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1616.] SATURDAY, JULY 29, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## SHAW'S AMERICAN HOT-AIR ENGINE.

Fig. 1.

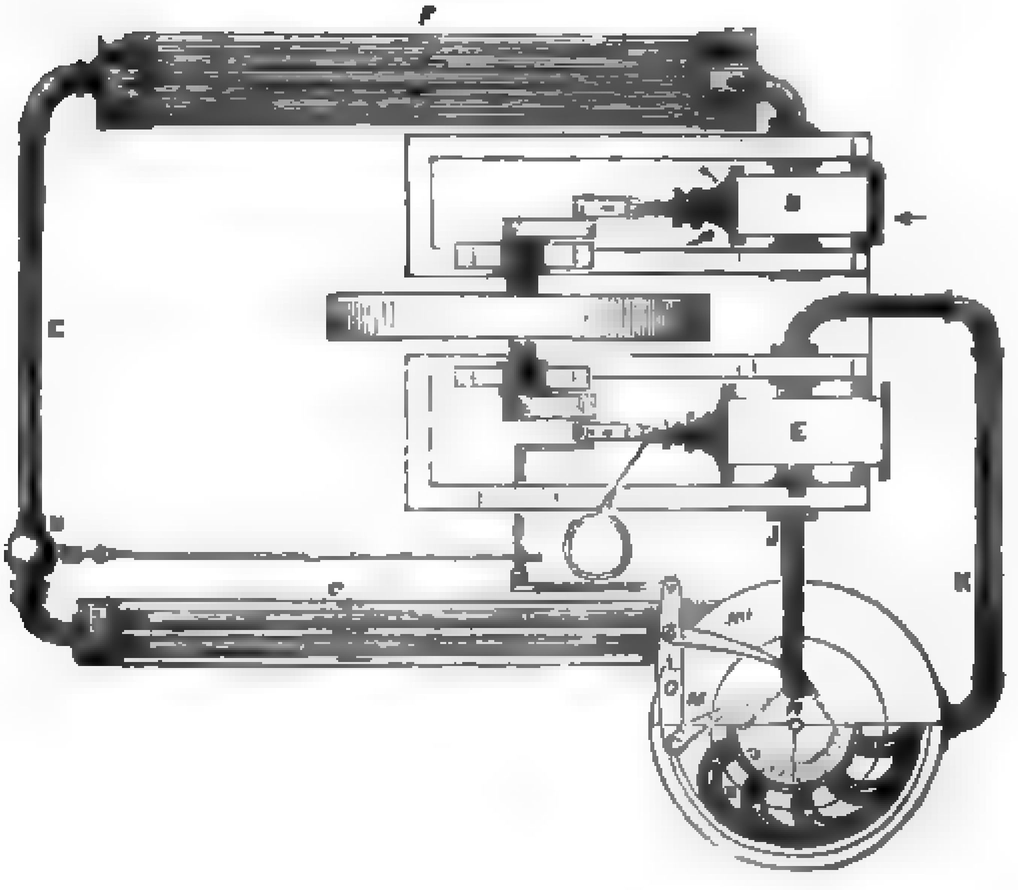
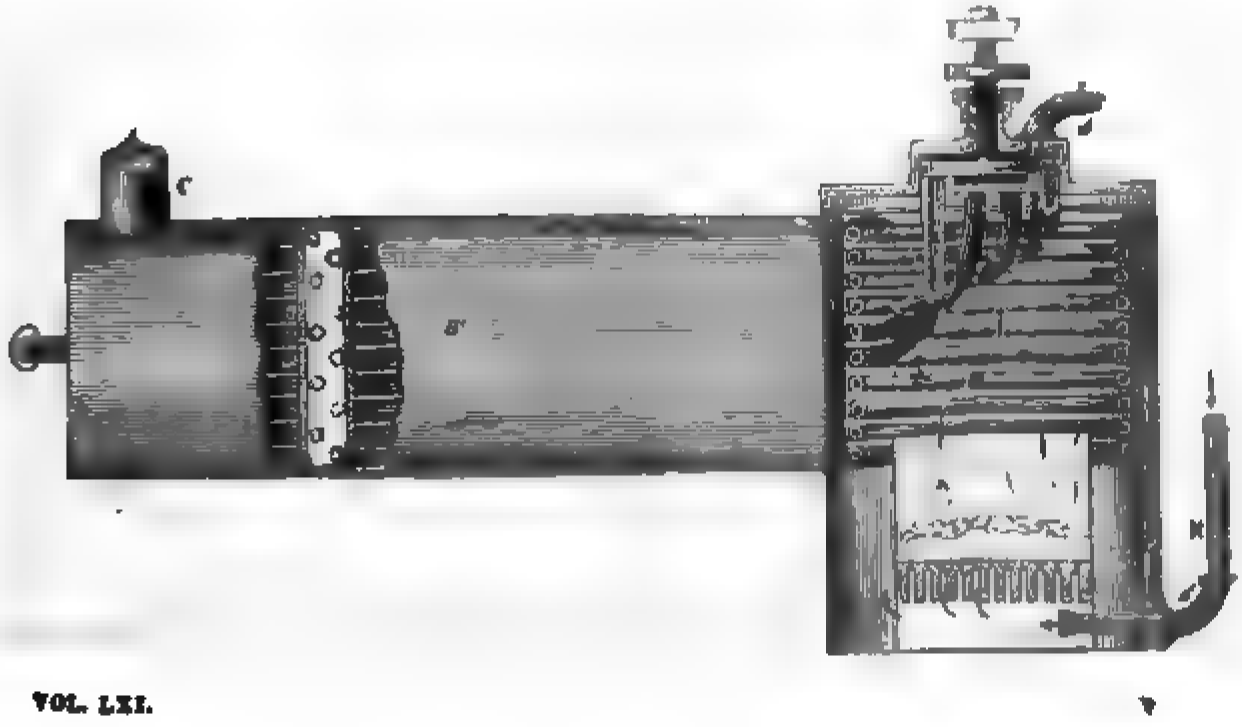


Fig. 2.



## SHAW'S AMERICAN HOT-AIR ENGINE.

The engravings on the preceding page represent a hot-air engine which comprises all the principal features of an invention patented some years since, by Mr. Shaw, of Massachusetts, but contains also certain improvements subsequently effected by the inventor. The *Scientific American* publishes concerning it the following description and criticism, which will be of interest to English readers:

Fig. 1 is a top view of the whole apparatus (the cylinder being an oscillating horizontal one) showing the air-compressing chamber, the entrance heating tubes, and the final heating tubes in section. Fig. 2 is an elevation, partly in section, of the air heater. The same letters refer to like parts on both figs.

A is the furnace; the heated products of combustion pass up on the outside of the final air-heating tubes, B, through the tubes in B′, and then through the smoke-pipe, C, in which are the entrance air-heating tubes, I. D is the feed air-pump, and E is the main cylinder, in which is the working piston operated by the hot air. The air-pump, D, takes in air from the atmosphere, and forces it into the compresser, F, where it is maintained at 60 lbs. on the square inch. From the compresser, F, it is admitted into the tubes, I, in the smoke-pipe through the pipe, G. There is a valve in the pipe at H, which cuts off and lets in the air to the tubes, I. The heater, B, is composed of a series of tubes, forming a coil, which are connected with a perforated rotating top-plate moved round by the vibrating beam, L, which operates the ratchets, M M′, which take into the teeth of the ratchet-wheel, N, secured on the cap of the rotating heater coil, B. The air fed into the tubes in the smoke-pipe takes up some heat from the escaping gases, and is admitted by rotation into the several pipes of the main heater furthest from the fire, while each tube in the coil which receives the concentrated heat of the fire, contains the exact quantity of air to be admitted into the main cylinder at each stroke; then for the next stroke the top-plate is moved one notch, and brought to communicate with another tube and to the steam-box and cylinder, E, and so on continually. The object of the inventor by this heater is to give time to the air to become heated, and not take in a fresh quantity of cold air to be heated at once under the piston of the main cylinder. This method of heating the air apart and separate from the main cylinder is certainly a superior plan, and the means for giving the air a long heating circuit from the time it enters the smoke-pipe tubes to its final admission into E, is very ingenious. It will be observed that the hot air, after acting upon the piston, is employed to feed the fire. It is exhausted through the pipe, K, and passes up through the grate, as shown in fig. 2. This is a good idea, and must effect a considerable saving of fuel.

The piston is kept cool, and the packing preserved from being burned out by a stream of water admitted through the hollow piston-rod by tubes, as shown, and which circulates through the piston, which is also hollow. The higher the air becomes elevated in temperature, its pressure increases; therefore, as it receives its concentrated heat of the fire in the coil-heater, B, its pressure is far higher there than where it is injected into the entrance-heating tubes, I. The advantage of this arrangement is, that it relieves the engine from working against the highest back pressure in feeding in the cold air, as it is fed into the feeding apparatus, where the temperature is comparatively low, while it is taken into the main cylinder, E, at its very highest temperature and pressure. The heads of the coiled pipes of the heater, B, are inserted close to the top plate, this latter acting the part of a rotating disc-valve. It is intended to have a stream of cold water circulating through the compresser, F, so as to carry off the heat of the air developed by compression, and thus have the air in as condensed a state as possible when it enters the heater.

We cannot see the advantage to be derived from thus reducing the temperature of the air, when that same temperature has to be given to it again—first cooling and then heating the air before it is used.

The main cylinder is 2006 inches area, and that of the pump 1209 area; the stroke of both is two feet. The power of this engine will be according to the quantity of air heated in a given time, and the temperature to which it is raised,—in other words, the pressure and velocity. The heat applied imparts the quality of expansion to the air. Expansion is the force of hot air, and it is measurable in quantity, the same as the force of gravity,—the quantity of water which falls in a given time through or down a certain length of space. Thus 491 volumes of air will expand to 982—double the volume—when it becomes heated to 491° Fahr., and at this temperature will exert a pressure of 15 lbs. on the square inch. This degree of heat is too high to be used in an engine; it would be impossible to keep the piston lubricated while exposed to such a temperature. The main cylinder, E, contains 27·85 cubic feet of air, and the feed-pump, D, has a capacity of 16·79 cubic feet.

To make the calculation easier, but not the less plain, let us assume that the capacity of E is 28 cubic feet, and that of D 16, the difference being 12, or three-sevenths in favour of E against the feed-pump, D. As the large cylinder can only receive one pump full from D every stroke, however much it may condense the air in F, it follows that the average pressure in E, during the stroke, if the air is heated to 491°, will be 15—6 3·7=8 4·7 lbs. on the square inch during the stroke. If the air could be heated to give 50 strokes per minute, the power of the engine would be 2006×8 4·7×100÷33,000=52·10 horse-power. But then to do this the heater must be able to heat 600 cubic feet of air to 491° above its atmospheric temperature every minute. The *Ericsson* engines made only 19 strokes (semi-revolutions of crank) per minute when we saw them in operation. The great bulk of air to be operated upon in an air engine, is the great obstacle to its use.

The fact is here revealed to us plainly, that it is impossible to use condensed air in air-engines, when the feed-pump is only equal or less than the main cylinder. It requires the feed-pump to be of greater capacity than the main cylinder to do this.

The new *Ericsson* engines, in which highly compressed air was stated to be used, were delusions, because the feed-pumps were of less capacity than the main cylinders. The quantity of hot air admitted into the main cylinder every stroke, and its temperature, are the exponents of its force. For example, if the pump, D, feeds the air into F at 60 lbs., and the quantity contained in the pump is fed into the heater, and takes up 491°, and then passes into the main cylinder, this is simply 16 cubic feet of air at atmospheric pressure reduced to 4 cubic feet. Thus 16×15 (491°)÷4=60; and 15×4=60.

The question of compressed and non-compressed air is just as broad as it is long; for it requires the same amount of power to compress it as is obtained afterwards from the same air in its compressed state, so that the simple question in relation to the power of any hot-air engine is resolved by the quantity of air at atmospheric pressure, heated to a certain temperature in a given time—the degree of heat determines the pressure and the space through which it will move the piston.

When properly understood, the question is very simple. We regret to state that scientific men—professors in some of our colleges—who have written on this subject, have involved it in mystery, by rushing into page after page of symbols and figures, to explain a question that requires only a very few figures in the most common rules of arithmetic. Calculating the effective force of hot air in a cylinder (under a certain pressure) at different points of the stroke, is labour lost in discussion; for such calculations merely relate to that economy of its use which is equal to that of steam, and which is practised in steam engines.

The great question to be asked in discussing hot air versus steam, is what advantage has air over steam? What is there in its nature that would render it superior as a motive agent to steam? It is far inferior to water raised into steam as a motive agent. The only single quality that it has, reasonably, over steam, is its inferior capacity for heat. Thus, while the capacity of water for heat is 1 0000, air is only 0·2669, or 0·7331 less. But one cubic inch of air, heated to 210°, will raise only 6·12 lbs. one inch, while one cubic inch of water raised to steam at 212°, will lift 15 lbs. 1728 inches. Now let us suppose that the air is 815 times lighter than the water, and of 3·75 inferior capacity for heat, the advantage is still with the steam:—thus 1728×15=25920÷815=31÷3·75=8, or about 2 lbs. on the square inch. The great bulk of air, in comparison with that of water, it being 815 times lighter than water, is an objection to its use. It requires huge cylinders amounting to about 217 times greater frictional surface than steam engines. It acts chemically upon iron, and oxydizes the parts exposed with great rapidity. The moisture of steam relieves the piston of much friction, and this is the reason why anhydrous steam (stame), when mixed with moist steam, produces better results than the stame. Steam at the low temperature of 283° exerts a pressure of 50 lbs. on the square inch, while air at 491° exerts one of only 15 lbs. The steam boiler is a reservoir of force, not subject to those sudden changes involved in an air heater, when such an immense bulk of air has to be heated for every stroke of the piston.

Mr. Shaw is a sincere and honest explorer in this field. He presents his engine to the American public, and has courted a candid criticism; and for this he deserves the thanks of the community.

## ON THE FURTHER APPLICATION OF STEAM TO NAVAL PURPOSES.

(*Concluded from page* 77.)

CAPTAIN SHULDHAM next proposes to connect a portion of the ropes by which the ship is worked to apparatus which he designates *evolutionary machinery*, and which is to be fitted on the orlop deck, where all such ropes must be led and belayed.

That every evolution may be performed with ease and ability, he recommends two

methods; one consisting in quickly attaching them to, and detaching them from, endless ropes in motion; and the other, in winding them round cylinders or winches, which should be connected to or let loose from the steam machinery at pleasure. By either or both of these methods, he considers that every evolution could be performed, which has been hitherto effected by manual labour alone; "not that every evolution should be performed by steam, but only on particular occasions, at the will of the captain or officer of the watch." If winches are preferred for working the ropes, he recommends the use of those containing the author's improvement, which consists in doing away with "surging" the rope, or in other words, hindering the parts of the rope from overlapping, as they do if not "surged" in the common wheel and axle; so that the winch would wind round a great length of rope, such as topsail halyards, or braces, with great convenience and despatch.* Should the other method of working ropes by endless ones in motion be preferred, the author has devised methods of attaching and detaching them; both methods might, however, be tried, and experience would soon decide which was the best. As many winches or endless ropes as would be needed when several ropes were used at the same time, (in order that they should be kept apart from each other, to be clear of all interference in a longitudinal direction, or in that of the pull of the ropes,) would of course have to be employed.

"By way of enumerating one or two cases in the working of the ropes, I should say, in 'tacking ship' with the watch, the after yards (in consequence of their quick turning when the ship was head to wind), might be braced round by manual labour, and the head yards hauled round by steam, and the topsails might be reefed by the watch, and hoisted by steam. It is useless to enumerate more instances, as the experience of those in command would soon know what amount of work should be executed by either power, or by both at the same time. The evolution machinery should, however, in my opinion, be capable of performing alone every evolution, and in quicker time than has hitherto been done by manual labour. Yet it would not do to let the men be idle; but there are cases, such as when men are exhausted after a battle, when they would require to have all possible rest given to them."

When everything has been arranged in the way which Captain Shuldham has pointed out, and found to answer, the next requirement would be, a contrivance by which the officer in command might readily communicate his instructions to the officer stationed on the orlop deck. This might very well consist of a simple telegraph containing a few sentences, relating to the ropes intended to be used on the orlop, such as "Haul round the head-yards to port," "Square the after-yards," "Belay;" "but, with regard to the latter word, in order to prevent the risk of the ropes being broken should the winches or detachments not be loosed in time, the said ropes should be marked; for instance, the braces, when the yards were braced up or squared, and the sails when hoisted up."

Besides the telegraph, there should be a gutta percha speaking-tube led from the quarter-deck to the orlop for giving verbal communications, which, together with *aides-de-camp* in the event of the tube and telegraph being shot through, would prevent any fear of a constant communication not being kept up between the quarter-deck and the orlop, giving every information of the state of the ship, such as the following: "20 shots between wind and water;" "2 feet water in the hold;" "The ship pumped dry, the carpenters having stopped the shot-holes;" "Starboard fore-brace and jib-halyards shot through," &c.

There would of course be spare telegraph lines and speaking-tubes on the orlop ready to replace those shot away, and also spare telegraphs for the quarter-deck. "It is useless to observe how much better all the evolutions of a ship in action would be performed in this simple manner than by taking the men from their guns: thus the jib (if the halyards were not shot away) might be hoisted instanter, and be the means of preventing the ship from running on rocks, if engaged near the shore, or from being placed in an awkward position with the enemy's ships." Many officers engaged with the enemy in the late war will know how to appreciate the above advantages.

"I must now embrace," says the author, "a part of the plan which is difficult for me to determine upon, because I am ignorant of the manner in which it is intended that steam sailing-vessels should cruise or keep the sea when not making voyages; that is, will they keep under sail for the sake of saving coal? or will they always keep their steam up, so as to prevent any chance of being surprised by the enemy when unable to use the screw? If the latter, I should recommend the machinery which I have described to be worked by the screw engine, but contrived to be connected and unconnected at pleasure; on the other hand, if the former, then I should propose a separate engine to supply the loss of

* A model of Captain Shuldham's winches was exhibited at the Dublin Exhibition.

manual labour. We will suppose a crew to consist of 1,000 men, the half of which would be 500; and as the power of five men are supposed to equal a one-horse power, it would require an engine of 100 horse power in lieu of their labour. I do not take the friction of the machinery into the account, because it cannot be imagined that 500 men would act simultaneously with their full power, so the lack of it may be set off against the friction of the steam machinery. Should it be required that the steam machinery should do the work of a whole ship's company, and with greater celerity than they can do it, then an engine of 200 horse power would not be too great. As only *occasional* evolutionary power would be required to be used at sea, it would be a good plan that some method should be devised for putting the power of both engines on the screw: a part of it would only be subtracted during the time the evolution was performed. The desirable points on this head would soon be discovered were the plan put in execution."

As the probability of ships being set on fire in action will in future be very great, the author proposes that there should also be on the orlop a force-pump, to be worked by steam, with a large hose attached to it, long enough to be led to any part of the ship which might be on fire, or which might, when necessary, be made long enough by separate pieces screwed on to each other; and should the fire assume a serious character, the magazine, by such a powerful fire-engine, could soon be inundated, and the ship prevented from being blown up; and as a pump so placed would not be exposed to shot, it would always be in a state of readiness when wanted. "I may here express a hope, that all the steam machinery which worked the screw, with the boilers, &c., would be equally sheltered, according to Admiral Sir Charles Napier's suggestion: this done, I would match a ship so fitted against any ship of equal tonnage, armament, discipline, and crew, with the conviction that victory would be hers, solely from her opponent lacking all the *anti-destructive* methods which I have pointed out; her fires would be speedily extinguished; and, if her masts and rigging were shot away, or a part of them, she would be lying like a log upon the water, when the other would be in a state to fire her broadside, and place herself in any position she chose, until she was nearly in a sinking state. This is such a striking difference, that nothing more need be said about it.

"Plans I know have been, and are being, tried for loading guns at the breech; and if that can be accomplished in *conjunction* with the non-recoil of the gun, it is the *ne plus ultra* of gun plans for naval purposes, and would of course nullify that part of my project which relates to the working of the guns; but, as the principal feature in my plan is the *reduction of the number of seamen*, such an invention would cause a further reduction, and therefore be favourable to my plan."

The two principal objections with which the Author has been met are, *first*, that a diminution of half a ship's crew would be most felt in furling *all sails together*; and *second*, that there would, with the reduced crew, be fewer hands to repel boarders. The former impediment might, he supposes, be in a great measure mitigated by giving the marines extra pay, on the condition that they would consent to go aloft to furl sails; and by adopting contrivances which might be made to assist the operation, by using the evolutionary machinery for all the work required on deck, giving assistance in this way to the men aloft. In discussing the latter objection, he suggests that it might be shown that there would in fact be men enough: "as all those stationed on the orlop deck, quite free from exhaustion, might be always in a state of readiness to rush up when ordered to repel boarders; the hot water in the boilers might be also advantageously used by the force-pump, with many hoses attached to it, the ends of which might be carried up by the orlop-men; in short, the ship might be defended like a fortress, whose numbers to defend it bear a small proportion to those of the assailants."

With regard to the arrangements which have been proposed for the orlop deck, Captain Shuldham does not intend that they should be entirely arbitrary, with the exception of the wings, and clear wide spaces for the whole of the steam machinery mentioned; the cabins, store-rooms, sail-rooms, &c., might be placed as already suggested, or wherever is thought most convenient: there would always be considerable disposable space amidships before the hatchways.

Again, with respect to the steam machinery it is a question, with the Author, whether it would not be the best plan to fix all of it on two strong shafts or rods—one on each side, with as many couplings and bearings as an engineer would consider necessary—all the cylinders, barrels, or wheels being allowed to run loose when not required to be worked. Any engineer having a knowledge of wheel-work and machines in general might contrive the necessary apparatus; or as there is now an abundance of naval engineers, one or more might be appointed to plan the anchor machinery, another that of the pump, and so on with all the rest; in fact, there would be no lack of talent and ingenuity if once the plan were

tried; but of course time would be required to bring such a startling project as this into anything like perfection.

The Author does not undertake to give a statistical account of the comparative expenses of a ship worked by manual labour alone, and of another worked by it together with steam power, but leaves the management of that to officials, in the event of the plan interesting the Government; the economical results of it cannot, however, be doubted. The whole annual expense would be (exclusive of the first cost of the machinery) the interest of that outlay, together with the additional consumption of coals, and the pay of the engineers required to look after the machinery: and all these have to be placed in opposition to the pay and support of the half of a ship's crew.

"With regard to the larger expenditure of coals of the half-manned vessel, it would not be so great as one would suppose; for if a 100-horse-power engine were required for supplying the loss of manual labour, the whole of that power would be seldom needed, as when working the anchor or in action, and that would be the time when but little propelling power was required, and at sea there would be evolutionary power only *occasionally* in use; so, by contrivance, the whole of the two powers, whether combined in one engine or two, might be exerted for propulsion, and so continued to be used in chace or retreat, or on any other important occasion when manual labour could perform all the evolutionary work. Now, in taking this view of the matter, the additional expenditure of coals would be inconsiderable, or, if not so, the vessel would possess a much greater propelling power than is used at the present day.

"As the orlop would be so much higher than ordinary, there might possibly be room for the stowage of coal in it; but when our ships are longer in their dimensions, their carrying tonnage will be so much increased, that I think there will be no lack of stowage of all kinds which a war ship may require."

We have no hesitation in saying that the foregoing changes, which have for their object the reduction of the seamen necessary for manning Her Majesty's ships, and consequently of the navy estimates (whether the nation be in a state of peace or war), ought to engage the attention of the Government, however startling the project may appear at first sight. Were it adopted, and found successful, the nation could then afford, as Captain Shuldham suggests, to pay her seamen even still better than under the late regulations.

In conclusion we may add the following passage, in which the Author, though not strictly correct in his statements, offers a suggestion which may be found profitable to ingenious persons:

"I cannot help pointing out what appears to my mind rather singular. We have been blessed with a forty years' peace, and during the whole of that time great progress has been made in inventions of a destructive character, and in training men in the use of them; so that, in any future naval engagement, no one can foretel what will be the extent of the destruction, although every one knows it must be enormous; notwithstanding, no one appears to have turned their minds to inventions or contrivances of anti-destructive qualities, which might at least mitigate the effects of the others, if they would not nullify them; so that one fleet, having the advantage of being fitted with anti-destructive inventions or contrivances, would be much superior to the one only having those of destruction. Now, in my plan, besides its economy, all my contrivances partake of the former, and I have no doubt that many other anti-destructive contrivances might be invented, such as the best mode of stopping shot-holes, and inventions for keeping a ship afloat.

"In the event of my project being thought, at first sight, too bold to be hastily adopted, I may observe that my idea of isolating the engine-room, and perhaps working the pumps on the orlop, may be thought worthy of adoption in ships in their present manned state. The former I most earnestly recommend, from my firm conviction that its adoption, both in the Royal Navy and in the mercantile marine, would be the means of saving many lives.

"I may also add that, were my plan adopted, there would, in future naval battles, be a saving of half the number of lives and of the wounded."

## ON THE PROBABLE NATURE OF THE SUN'S BODY.

BY THOMAS WOODS, M.D.

The physical nature of the sun's body, whether it be solid, gaseous, or both, is a matter of doubt to philosophers. The peculiar appearance of the spots and the changes they undergo, lead to the supposition that a gaseous envelope surrounds whatever may be the interior; and Arago's determination, that the sun's direct light is not polarized, renders it probable that the envelope is flame.

I have lately made some photographic experiments, which may tend further to the establishment of this opinion. It has been long known that the light proceeding from the centre of the sun is more intense than

that from the edge. I have taken several pictures of the sun in a camera obscura, by means of a photographic process, exposing the prepared surface of the plate to be acted on for different periods of time. For instance, the camera being set, and the prepared plate in focus, I have allowed the picture of the sun to fall on it for as short a time as it was possible to uncover and cover again the aperture. I then opened the aperture again for a somewhat longer period, having first moved the plate so that another part of it would be acted on. I caused the picture then to fall on another portion of the plate for a longer time, and so on, taking on the same prepared surface six or eight pictures, each the result of a different length of exposure. The examination of these pictures showed that they were of different *sizes*, the smallest being produced by the shortest exposure; and that they increased in extent with the length of time the aperture was open up to a certain size. The centre of the picture was apparently intensely acted on, as it had the appearance of being what photographers call "burnt." And this deep spot was surrounded by a ring of light not so darkly marked. The "burnt" centre increased in size, not in depth of intensity, with increased length of exposure; the ring about it also increased, but not in proportion to the enlargement of the centre. A piece of red glass placed before the aperture of the camera renders the sun's action less powerful, and allows the pictures to be taken less rapidly. These experiments are a further proof that the light from the centre of the sun acts more energetically than that from the edges; the latter requiring a longer time to produce as much effect as the former on a photographic surface.

I thought that these experiments might furnish a ground for obtaining evidence of the probable nature of the sun's envelope. I determined to try whether *flame* would affect a sensitive plate after a manner similar to the sun; and if so, whether a *solid* body producing light would differ in its action. I therefore exposed a prepared surface in a camera in the focus of a lighted candle, and also of a gas-jet. In both cases the action was exactly similar to that of the sun, but more marked as to variety of extent, in the size of the pictures produced, because the light was not so powerful, thereby allowing more leisure in the manipulation. The picture of the flames in one second made a slight impression, in two seconds the impression increased in size and apparent depth of action, and so on, up to 15 seconds, when the picture produced was about three times the size of that taken in one second in the case of the gas-jet. In numerous experiments I have made with flames, caused to burn steadily, lest the wavering might influence the result, I have always found that their action on the plate was similar to that of the rays from the sun's disc, viz., an increased extent of picture for an increased period of exposure.

It now remained to try what effect a solid body giving out light—not reflecting it—would produce. It was not easy to find a means of heating a solid body sufficiently high to get a light capable of acting on a sensitive plate. I tried iron heated to whiteness, and platina in the flame of a gas-jet, but neither affected the plate in a camera. The lime-light, however, acted well. A piece of lime acted on by the oxy-hydrogen blowpipe was rendered luminous, and a picture of it thrown on the prepared surface by the camera. In one second a deeply-marked image was produced; and the *size* of the picture of the solid was not influenced by the length of time of exposure. I at first thought a very slight difference of size was apparent in pictures produced by largely different lengths of time the plate was acted on; but I found, on examination, that the appearance was produced by the gases employed to heat the lime. I mention the circumstance in order to guard others from the mistake.

Taking into consideration all the experiments I have made, I have no doubt that the light from the centre of *flame* acts more energetically than that from the edge on a surface capable of receiving its impression; and that light from a luminous solid body acts equally powerfully from its centre or its edges; and therefore conclude that, as the sun affects a sensitive plate similarly with flame, it is probable its light-producing portion is of a similar nature.

In the experiment I have just spoken of, I used a sensitive surface prepared according to a formula which I am anxious to publish, as I believe it will be found more sensitive, and perhaps more easily manageable than any other hitherto known. I have by means of it taken a very good picture of a building, on a bright day, in as short a time as it was possible to uncover and cover again the aperture of the camera with the hand. The length of the focus of the lens was 6 inches, its aperture ⅝ths of an inch in diameter. The process differs from the usual collodion one, in substituting a mixture of iodide and chloride of iron for iodide of potassium, and using collodion, having in solution some common salt. In 1844, I first introduced the iodide of iron as a photographic agent. I found it at that time the most sensitive I could procure; and since then, whether in processes on paper, or in albumen or collodion on glass

plates, I have always succeeded with it better than with any other, both as to rapidity and facility of use. Mr. Fox Talbot has found it sufficiently sensitive when employed with Mr. Hunt's discovery of sulphate of iron, to produce instantaneous results. The details of the process are as follows:—Take of

| | |
|---|---|
| Sulphate of iron.......... | 40 grains. |
| Iodide of potassium ...... | 24 grains. |
| Common salt ............ | 6 grains. |
| Spirits of wine or alcohol .. | 2 oz. |
| Æther.................. | 2 drachms. |
| Strong water of ammonia .. | 3 drops. |

Powder the salts and mix them well together, all the alcohol and æther, and finally the ammonia. Allow the precipitate to subside. For preparing the plate, mix one part of the clear solution with three parts of collodion, to which has been added a saturated solution of common salt in the proportion of one fluid drachm of the salt solution to four ounces of collodion. Spread on the glass plate in the usual way, and immerse it for one minute to one minute and a half in a neutral solution of nitrate of silver, 30 grains to the ounce. Develope the picture with a solution of sulphate of iron one scruple to the ounce of water; and finally fix with the hyposulphite of soda. A very beautiful picture may also be obtained by using the developing solution of sulphate of iron, of the strength of 20 or 30 grains to 4 ounces of water, and adding to the hyposulphite wash strong water of ammonia, in the proportion of 20 drops of the latter to 6 or 8 ounces of the former. The iron solution should be well washed off previously to putting the plate in the ammonia and hyposulphite. By this process I have obtained most exquisite pictures in very short spaces of time. In many cases the light parts of the pictures are pure silver, forming a good mirror.

Alkaline reaction in the bath or the collodion causes cloudiness, which may, however, be remedied by a corresponding amount of nitric acid. If a bottle of strong ammonia be left open in the room where the plate is prepared, cloudiness will be produced. I brought for a few minutes a dish containing a solution of hyposulphite of soda, to which had been added a small portion of hydrosulphuret of ammonia, into the room in which I prepared a plate, and for some hours after I could not get a picture without cloudiness. By thoroughly ventilating the room I got rid of the annoyance. It would therefore be better if the ammonia be added to the hyposulphite solution, as recommended above, to keep it at a safe distance from the other materials. I have also found that filtering the caustic solution through the red-coloured blotting-paper is sufficient to produce alkaline reaction and cloudiness.—*Philosophical Magazine.*

Parsonstown, June, 1854.

## COMPOUNDS AND THEIR CONSTITUENTS.

Dr. E. Franklin, F.R.S., recently delivered, at the Royal Institution, a Lecture *On the Dependence of the Chemical Properties of Compounds upon the Electrical Character of their Constituents.*

The lecturer first directed attention to the remarkable continuity and correlation of the natural forces, owing to which the philosopher seeking to eliminate the effects legitimately due to each, frequently experienced the greatest difficulty in separating the true results of a single force from the cognate influence of other forces. Such difficulties were more especially encountered in the manifestations of the chemical force or chemical affinity, which rarely or never acted singly and alone, but was constantly accompanied, modified, and controlled by collateral forces, which alternately exalted, depressed, or altogether inverted it.

The powerful influence of cohesion and heat especially attracted the attention of Berthollet, and so impressed that profound philosopher with their potency, as to lead him to ignore completely the existence of a separate chemical force. Notwithstanding the otherwise singularly ingenious and sound conclusions of this chemist, the lecturer believed that later researches had demonstrated the total denial of a distinct chemical force to be untenable.

The influence of electricity upon chemical affinity was perhaps even still greater than that of cohesion or heat; the most powerful combinations being broken up by this agent, if its operations were favoured by the two conditions—mobility of particles (fluidity), and conductibility of the electric current. The phenomenon of the evolution of the separate elements of a binary compound, at the opposite poles of the decomposing cell, was one of the most remarkable attending the resolution of compounds into their elements by the electrical force. It immediately attracted the attention of philosophers, and almost forced upon them the conclusion that such elements were oppositely electrified.

Davy was the first to seize upon these facts and model them into an electro-chemical theory, which, notwithstanding its defects, was at least as soundly philosophical as those which succeeded it. Davy supposed that the elements in their uncombined

condition did not contain free electricity, but that by contact they became excited. Thus, a particle of sulphur became negative when placed in contact with a particle of copper, which last was simultaneously rendered positive; the application of heat intensified the charge, until at a certain point the tension of the two electricities became so high, that they suddenly recombined, carrying with them the molecules of copper and sulphur, which were thus intimately mingled, whilst evolution of heat and light resulted from the combination of the two electricities. Ampère and Berzelius subsequently attempted to remove some of the difficulties which were encountered in endeavouring to make Davy's theory embrace all chemical phenomena. Ampère considered each element to be permanently endowed with a definite amount of one or the other electricity, being thus invariably either electro-positive or electro-negative to an extent dependent upon the intensity of the charge. Such a naturally charged molecule Ampère imagined to attract around it an atmosphere of the opposite electricity of corresponding intensity, and that when two molecules oppositely charged were brought in contact, their atmospheres of electricity united, giving rise to the heat and light of chemical combination, whilst the original charge retained the attracting molecules in permanent union. Although this theory elucidated some points which Davy's view left unexplained, yet it would not be difficult to start several very serious objections to it. The attempted removal of these gave rise to the electro-chemical theory of Berzelius, who supposed that each element contained the two electricities, but that the one was more powerfully developed than the other, as in the case of a magnet in which one pole, by being divided, was apparently weaker than the other. In chemical combination, Berzelius imagined, that one of the electricities of each element was discharged, producing the heat and light of chemical action, whilst the other was retained and served to hold the elements in combination.

But these attempts of Ampère and Berzelius to improve the theory of Davy succeeded perhaps less in perfecting our views of electro-chemical phenomena than in demonstrating the necessity for much further research, before these phenomena could be satisfactorily interpreted; for these theories, in which different degrees of affinity were explained by differences in the degree of electrical excitement, have been proved radically defective by the remarkable discovery of Professor Faraday, that compounds, whose elements were united by the most dissimilar degrees of affinity, required equal quantities of electric force for their decomposition.

Such defects in the attempts to account for chemical phenomena by electrical agency, led Dumas and other chemists to reject altogether the idea of electro-chemical combination. Dumas regarded a chemical compound as a group of molecules connected by a single force in a manner analogous to a planetary system, and the chemical character of a compound as dependent upon the position of the separate molecules, and not upon their individual character. This beautiful and highly poetical view would neither have received such an extensive adoption, nor have been the parent of such numerous and brilliant discoveries in the organic portion of the science, if it had not contained a profound truth. Nevertheless the Lecturer conceived that the total abnegation of the influence of the electrical character of elements upon the chemical properties of their compounds, implied by this theory of types, was directly opposed to many of the phenomena of chemical combination, which invariably revealed such a connection.

The effect of successive additions of oxygen to an electro-positive element, in gradually weakening its basic, and consequently electro-positive, qualities, and finally converting it into an acid or electro-negative body, was well known in the case of manganese, iron, chromium, gold, &c., but the effects of the juxtaposition of two or more elements of similar electrical character had not hitherto been much studied. Granting the existence of an electrical charge associated with the molecules of matter, it was evident that such a union of atoms as that just mentioned would resemble two approximated globes similarly electrified. Now the effect of the approximation of two such globes would be the intensification of the charge of each; and therefore, if there were any connection between electrical and chemical character, it would be exemplified by an increased energy of affinity under such circumstances. Examples of such an approximation of atoms of similar character were not wanting, even amongst inorganic bodies; thus the compounds of chlorine with oxygen were remarkable instances of the union of like atoms; and we saw in several of them the truth of the foregoing proposition fully borne out. Hypochlorus, chlorous, and chloric acids were all distinguished by the intense energy of their affinities and contrasted strongly with the compounds of oxygen or chlorine with electro-positive elements.

The compounds of phosphorus with hydrogen also exemplified the same effect. Phos-

phorus, though usually regarded as an electro negative body, was yet far more closely associated in its general character with the metals than with the metalloids; we were therefore entitled to regard a compound of this element with hydrogen as a juxtaposition of two similarly electrified atoms. Now two of the compounds of phosphorus with hydrogen, viz., bin-hydride and terhydride of phosphorus, were remarkable for the intensity of their affinities, the one being spontaneously inflammable and the other merely requiring a diminution of pressure, when mixed with atmospheric air or oxygen to determine its combustion.

But the influence of the electrical character of elements upon the chemical properties of their compounds was perhaps most strikingly seen in the behaviour of the organo-metallic bodies, nearly all of which had only recently been discovered. Most of these bodies, which, in their isolated condition, consisted of two or more similarly electrified atoms, were distinguished by an intensity of affinity which was quite foreign to their proximate, or even elementary constituents. Zinc and methyl, for instance, were neither of them distinguished for any remarkable energy of affinity in their free state; but united as zinc-methylium, they formed a compound whose combining energy surpassed that of all known bodies, and this behaviour was shared in also by the corresponding compounds of zinc with ethyl and amyl. In cacodyl, stanethylium, stibethylium, and the new compounds of arsenic with ethyl, we had additional and striking evidence of the same law, for the affinities of arsenic, tin, and antimony, were, in these compounds, exalted in a most remarkable manner by the approximation of similarly electrified atoms.

These examples seemed to prove clearly the great influence of the electrical character of elements upon the chemical properties of their compounds; but further study of the subject also revealed the paramount influence of molecular structure, which modified and controlled the effects of electrical character, and limited all affinity, however heightened by electric induction. To this effect of molecular arrangement was no doubt to be attributed the occurrence of some apparent anomalies which, at first sight, appeared to contradict the general law just laid down, such as perchloric acid, biphosphide of hydrogen, &c.; but the pursuit of the subject into this ramification would have far exceeded the limits of the lecture, the chief object of which was to point out that, although all the electro-chemical theories hitherto proposed were far from satisfactory, yet that amongst the factors of chemical action, the electrical character of elements could not be denied a place without ignoring and leaving unexplained some of the most remarkable of chemical phenomena.

## LECTURE ON PEAT CHARCOAL.

BY PROFESSOR WAY.

Professor Way remarked that, independently of the noxious gases resulting from the putrefaction of animal matter generally, and which consisted principally of sulphuretted hydrogen and sulphuret of ammonia, each particular animal substance, excretionary or otherwise, had its *peculiar* odor, which, although abundantly perceptible by the senses, and, in many cases, as in musk, almost inexhaustible, was inappreciable in weight; therefore, by deodorising a large amount of odor, it was not to be inferred that a large amount of manuring matter was thereby secured. He then enumerated the various single and double deodorisers that had been employed.

He referred to Sir William Burnett's excellent application of chloride of zinc, and to the ordinary chloride of lime; to gypsum (sulphate of lime), and its conversion in ammoniacal atmospheres into sulphate of ammonia and carbonate of lime; to the agreeable odor of pure ammonia, and its power of giving intensity to odors of a disagreeable character, which intensity was lost when the ammonia was withdrawn; to sulphate of iron (green copperas), which when powdered and thrown into tanks turned black, on account of the sulphuret of iron formed on the decomposition of the sulphuretted hydrogen present.

He then proceeded to the consideration of charcoal as a deodoriser. He gave an interesting statement of the peculiar action of charcoals in general, arising, he believed, from the great amount of surface their spherical interstices presented, and of the particular action and superior value of animal charcoal over all others. He referred to the theory he had been led to form of this peculiar difference, and to a very successful imitation of animal charcoal, which he and Mr. Paine had made, in reference both to deodorising and decolorising properties, from the light porous silica-rock, found on Mr. Paine's estate in Surrey, which when broken up and steeped in heated tar, was put into a gas retort, where the tar was burnt off in the state of very pure gas, and a residuum left of the new silicated charcoal in question.

He explained that in charcoals it was not the amount of carbon they contained that constituted their value, but the mode in whioh the carbon was distributed; that

animal charcoal contained only 10 per cent. of real carbon, while wood charcoal contained 90 per cent. He referred to the large amount of water, 50 or 60 per cent., which peat charcoal took up, and to the fallacious dry state of the manures with which this water-carrier was mixed. He feared this mode of introducing water in a latent state into manures, in many cases, gave a turn in the scale more in favour of the manufacturer than of the farmer. He doubted whether peat-charcoal could be used economically for the purpose of soaking up tank-water; if not, he feared it would prove of no advantage, in other respects, as a remunerative agent to the farmer It had been long before the public, but had not progressed in market value, as it would have done had its application been successful. He considered it to lead to much error in practice, that the exact nature of the action of charcoal on ammonia was not better understood by the public. Fresh-burnt charcoal would absorb a large quantity of ammoniacal gas, but it was a mistake to suppose that it would consequently abstract ammonia from a liquid impregnated with it; on the contrary, water had the power of displacing from charcoal the whole of the ammonia it had received in a gaseous state within its pores. Peat charcoal did not either make manure or separate it from sewage; it simply rendered manure portable. He exhibited a striking experiment, showing the power of *dry* peat charcoal to arrest odours. Two open tumblers were half filled with the most offensive sewage-matter Professor Way could obtain, and the surface of each mass covered with a film of thin paper and a thin bed of powdered peat charcoal resting upon it. These tumblers were in this state handed round to the members, who ascertained the perfect manner in which the sewage-matter was thus rendered no longer offensive to the smell. He then gave an interesting account of the process of Mr. Stothert, by which sewage-matter was reduced, by a double action of purification, into clear water and inodorous precipitate—a process admirably adapted for sanitary purposes, although not for those of agriculture, as the more valuable manuring matters were held in solution and carried off in the pellucid liquid, while the precipitate was comparatively an inert mass.—*Chemist.*

## A NEW METHOD OF DRIVING SCREW PROPELLERS.

We have to announce an interesting experiment which was made yesterday on the Seine. Although there was but a very light wind, a trial was made with a small clipper, a *mètre* long, furnished with a particular system of sails disposed so as to communicate motion to a screw, which was intended to propel the vessel in the same manner as an ordinary screw driven by steam.

M. Salles, the inventor, and M. Signol, who have executed the mechanism, have given to their system the name of the "*hélice éolienne.*"

With an ordinary breeze, the *hélice éolienne* of the little clipper attained on the trial a mean speed of 120 revolutions a minute, and communicated to the miniature vessel a good velocity in all directions. The inventors hope that their discovery, when applied to ships, will give results analogous to those obtained in steam vessels, and that their screw, not less than that driven by steam, will be capable of being stopped, or set in motion, either ahead or astern, easily and with promptitude. If experiments made on a large scale give the sanction of practical utility to this invention, it will undoubtedly induce radical changes, by combining the use of sails and of steam. The ordinary screw will of course be retained, and the steam engine that propels it, but the former will also have adapted to it the proposed mechanism for transmitting to it the force of the wind also; so that when a sufficient breeze blows, from any quarter, a great saving of fuel may be effected. One of the consequences of the application of the *hélice éolienne* to steamers will be that those which run in latitudes in which the trade winds blow, with a constant force and in the same direction during a part of the year, will be enabled to devote to passengers and merchandize much of the space now appropriated to the stowage of fuel.

Messrs. Salles and Signol propose, after having effected in it what modifications may be deemed necessary, to submit their invention to a competent commission. It is to be hoped that the examination will prove favourable to their discovery, and recompense them for their labours.—*Translated from the Journal de Rouen.*

## APPEARANCE OF THE EARTH FROM A BALLOON.

Mr. Elliott, the aeronaut, in a letter giving an account of his last ascension from Baltimore, says of the appearance of the earth from a balloon:

"I don't know that I ever hinted heretofore that the aeronaut may well be the most sceptical man about the rotundity of the earth. Philosophy imposes the truth upon us, but the view of the earth from the elevation of a balloon is that of an immense ter-

restrial basin, the deeper part of which is that directly under one's feet. As we ascend, the earth beneath us seems to recede—actually to sink away, while the horizon gradually and gracefully lifts a diversified slope, stretching away further and further to a line that, at the highest elevation, seems to close with the sky. Thus, upon a clear day, the aeronaut feels as if suspended at about an equal distance between the vast blue oceanic concave above, and the equally expanded terrestrial basin below."

## WEBB'S ROTARY ENGINE.

Mr. Webb, of Dalston, has invented a rotary engine, which consists of a fixed cylinder with an end cover, through which passes a hollow axis, by which the steam is conducted from the boiler to the cylinder, and on which is fixed a piston touching the interior of the cylinder in two points.

There are two or more abutments or slides passing from the exterior to the interior of the cylinder, their ends being in contact with the piston. In one of the end covers of the cylinder there are openings for the fluid to pass out of the cylinder. There are passages through the piston communicating with the hollow axis, through which the fluid flows and presses against and moves the piston round with its axis. The back of the piston towards the vacuum or least-pressure side is a convex curve, offering a larger extent of surface than the front of the piston through which the fluid flows or passes.

Fig. 1 is a section of this engine, taken transversely through the axis; and fig. 2 shows a section taken through the axis and engine longitudinally; and fig. 3 is an external view. *a* is the steam or fluid-pipe into the box, *b*, from which it flows by the passages, *c c*, by the passages, *d*, through the piston, which enlarge as they proceed outward from the centre. The piston touches the cylinder, *h*, at two places at all times, as shown. The cylinder, *h*, is made with three recesses for buttresses, *e e*, which move on axes so as at one time to lie within their recesses, and form a continuation of the interior of the curve of the cylinder, *h*, and at other times they become buttresses to the fluid, the pressure of the fluid pressing one edge of them against the piston, as is shown. The buttresses have weights, *x*, which tend at all times to place the buttresses into a position to resist the pressure of the fluid, and thus to force the piston round within the cylinder; *f f* are the outlets by which the fluid flows from the exterior of the cylinder, *h*; *g g* are the slots to work the valves, *f*[1] *f*[1].

Fig. 1.

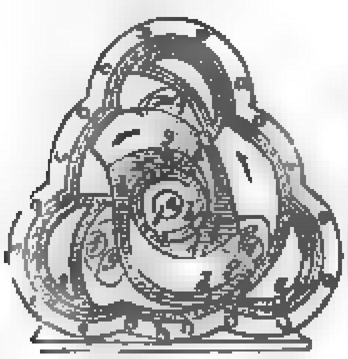


Fig. 2.

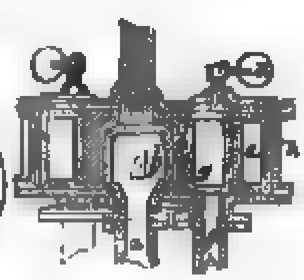
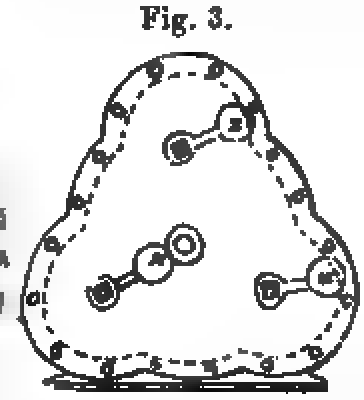


Fig. 3.



## ON THE EDUCATION OF OUR MANUFACTURERS.

*To the Editor of the Mechanics' Magazine.*

Sir,—Much has been said and done to forward the education of our operatives, and, judging from the prevailing spirit of that class, good results will no doubt, ere long, arise from it. A common observer, on visiting our various machine-making establishments, on coming in contact with the workmen employed in them, will find that in some points a great deal yet remains to be done. Take, for instance, the shops engaged in the construction of power looms and machinery of that class. In many of these, the masters have risen from men brought up to the use of the file or lathe, and who probably have undergone no proper system of education beyond what could be had in their narrow sphere, and even the indulgence in this has been often attended by other privations. I say take the establishments presided over by these men, and you find a correct knowledge of the leading principles of mechanics is sadly wanted. It

may be asked—How is this to be obtained at such a rate as to be within the reach of such men? In answer to which I will only point to the great number of good and cheap periodicals and publications appearing almost every day; and I shall not be accused of saying too much should I mention your own as a correct sample, and as a means to accomplish the object in view. To return to the before-mentioned establishments for the manufacture of power-looms, how often do we see the fantastical shapes and curves given to the levers employed for the various motions, when a straight lever would answer the purpose better, and in many cases would have the advantage in point of strength. They seem to ignore all rules with respect to these points, and will often place a lever in the most unsuitable position. Take, again, the various expedients they are obliged to adopt in bolting the brackets, &c., to support the various shafts and tappets, and you will often find them cutting the framing nearly away in parts to allow the rods to clear it. Now I need not say how all this could and would be avoided if the superintendents only possessed the slightest knowledge, and would sketch the work out previous to the pattern being made. If this were done in all cases, I am quite sure a great amount of labour and expense would be saved, and we should at the same time have presented to the eye, on looking over the loom, a much more mechanical arrangement of parts; and we might also take into consideration the convenience of referring to the drawings at any time after the looms or machinery have left the workshop, in order to replace any part that may be required by breakage, &c.

Compare with the above state of things what goes on in a first-class engineering establishment; how differently are order and method preserved in the one to the other, although the workmen remain about the same. It is to be hoped the day is not far distant when all our workmen will know a little of the sciences—that they will be able to make a sketch or drawing for the work, and also have a correct knowledge of the principles of mechanism and natural philosophy. The cost of books on these subjects (as I before mentioned) enables them to possess all this. Would they only turn their attention in the proper direction, as they are now acknowledged to be good workmen so far as their manual operations are concerned, so we might expect them to be good in an intellectual sense; and I am sure they would derive lasting benefits from the communication of their ideas concerning the departments they may be engaged in. Your kindness at all times in drawing attention to any subject for the advancement of the mechanic will, I trust, be a sufficient excuse for thus troubling you.

I am, Sir, yours, &c.,

ENGINEER.

Manchester July 19, 1854.

## IMPROVEMENTS IN CANDLESTICKS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I herewith send you a candlestick, to which I have had some slight improvements added for rendering it convenient and economical in use. Wax lights and mould candles, exactly fitting the sockets of the candlesticks in which they are burned, are not used by all classes of society; in fact, a great number of small candles are commonly burned in large socket candlesticks. Many contrivances have been brought before the public for fixing such candles; but in consequence of being detached from the candlesticks, they are, if purchased, generally soon thrown aside, lost, or forgotten, and recourse is had to the old expedient of wrapping round the lower end of the candle a piece of paper, which, if not removed in time, takes fire, and is not only wasteful, but dangerous. To remedy this defect, springs to retain the candle should be fixed to the socket, and the slide (for raising the candle) should have small spikes or a cup-shaped button fitted to its upper end, and be made long enough to lift the lower end of the candle above the top edge of the candlestick, so as to allow the candle to burn out completely, without removal, waste, or danger.

I think that candlesticks made on this principle, and at a cheap rate, would meet with a large sale. The model and the suggestions are entirely at your service.

I am, Sir, yours, &c.,

EDWARD COCKS.

135, High-street, Southampton,
July 16, 1854.

[The above suggestions of our correspondent are of considerable practical utility. The specimen candlestick forwarded to us is fitted with springs which rise from the top, so as to clasp a candle of any size (within certain limits). There is no doubt that it will answer the designed end perfectly. The improvements, though very useful, are of so simple a character, that the letter does not require to have an engraving annexed to it.—ED. M. M.]

## MINASI'S IMPROVED ARTIFICIAL INCUBATORS.

Mr. Carlo Minasi, of London, has recently applied himself to the study of the processes of artificial hatching, and has constructed an apparatus, the success of which is exciting considerable interest among those persons who concern themselves with this exceedingly interesting and important subject. Every one who is familiar with the expedients adopted by M. Bonnemain, of Paris, during the last century, and the processes practised by M. D'Arcet, at the hot mineral springs; and, indeed, every one possessed of a knowledge of the circumstances under which the natural hatching of eggs is effected, will be aware that a steady heat of a suitable temperature, maintained for a certain number of days, and a sufficient quantity of fluid to supply the place of the aqueous exhalations which pass off from the egg during incubation, are necessary to the success of any attempt to produce the chick from the egg, in a healthy and natural condition.

In order to supply these, Mr. Minasi constructs a watertight case or tray of zinc, of about 1 inch in depth, and fills it with water, which is maintained at such a temperature that a layer of fine sand placed on the upper surface of the case is constantly kept by it at about 107° Fahr. Upon this layer the eggs to be hatched are placed, and covered with a sheet of glass or other suitable substance. In order to furnish the vapour necessary to compensate for the aqueous evaporation from the egg, which, if allowed to proceed to a great extent without any counteracting action, would lead to the destruction of the chick *in ovo*, the inventor arranges in the incubator a number of short tubes, extending from the under side of it to the upper, and reaching above the layer before mentioned, so that atmospheric or other moisture may pass up from beneath and distribute itself over the whole of the surfaces of the eggs. The lamp employed is fitted with certain improvements, also effected by Mr. Minasi, by which naphtha is burned, without the use of a wick, so as to keep up a constant temperature for several weeks without any attention. And in order to economize the heat obtained from the lamp, the former is made to traverse a spiral flue, to the sides of which a portion of it is continually transferred, a minimum quantity passing off through a pipe opening into the atmosphere. The heat transferred to the flue, as just described, is communicated to the water; and by the simple expedient of raising one end of the incubator, a continual circulation of the heated water is kept up throughout it. The under side of the zinc case is corrugated, in order that the chicks which are reared in a chamber, of which it forms the upper part, may the better nestle against it.

We have seen about 150 chicks, hatched and reared by this apparatus, from two hours to ten weeks old, which were in an exceedingly good condition. At the first experiment made with the incubator, Mr. Appleyard, of Harrow, marked forty-eight of the eggs placed in it, and from this number, thirty chicks were hatched and reared. When this fact is added to the further one that while the cost of other far less successful incubators is about twenty guineas to every hundred eggs they are capable of hatching simultaneously, Mr. Minasi's will not exceed five guineas, we think there is but little doubt that that gentleman has effected great improvements in a process which will probably become very extensively and profitably practised. We shall probably publish engravings of the apparatus in a future number.

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*The Cyclopædia of Useful Arts.* Edited by Charles Tomlinson. London: George Virtue and Co.

Although we have already frequently expressed our approbation of this work, we cannot pass over its completion without reiterating our testimony to its high merits. And in doing this, we are perfectly aware that to commend cordially such a work as this—a work of great magnitude, comprising essays on the most elaborate and complicated processes of the arts and manufactures—is implicitly to attribute to its author an amount of success which not many writers could have secured in such an undertaking. But Mr. Tomlinson has prepared the way to this success by entering upon his task with just conceptions of its nature and importance—primary essentials of all full and perfect achievements. To the preparation of these volumes he has undoubtedly devoted himself with "a well-stored mind, and an earnest purpose," and the result has been equal to our highest expectations. With a "*Cyclopædia*" not much can be done in a small compass towards a fair analyzation of its contents; it must either be approved or condemned in general terms. If we had discovered in the present work articles deserving the strictures of a severe criticism, we should not have refrained from pointing them out, and dealing suitably with them.

The following remarks, which we select from the author's preface, are of evident importance, and while they bear to some

extent upon the subject of the interesting letter of our correspondent, "Engineer," which appears on a preceding page, they serve also to show that Mr. Tomlinson has had a wise and excellent object in view while producing these volumes.

"It is likewise necessary to understand the connection which really exists between the useful arts and science. A distinction commonly made between art and science, supposes the one to be eminently practical, and the other purely theoretical. The practical man, who supposes that he owes everything to experience, not unfrequently applies the term *theorist*, by way of reproach, to the man of science; while the latter, who imagines that his best knowledge is based upon theory, often regards the practical man as one whose skill and judgment are limited to a small range of routine operations. This feeling is injurious both to science and to the useful arts, for there is no doubt that they are mutually dependent, and that the advance of one must lead to a corresponding advance of the other. A large number of manufacturing processes have preceded scientific theory; they were discovered after repeated trials and failures of other processes; a slow and costly method necessarily standing in the way of improvement. Moreover, the processes thus discovered were kept secret, and formed the *mystery* of the trade, gradually revealed to the young mechanic in the course of his apprenticeship. Nor could the master pretend to do more than teach the processes in their prescribed order: the reasons for them, and for one particular order rather than another, he could not teach, and hence the *art and mystery* gradually assumed a fixed and consolidated character, apparently incapable of improvement.

"But, as science advanced, light was gradually introduced into the domain of the useful arts; sight and intelligence were given to processes which had hitherto been groping in the dark; while science herself obtained rich stores of facts, which have since been moulded into many a useful theory. The theory itself (which is nothing more than a number of truths connected by one or more common principle) thus became not only the benefactor and improver of the useful arts already in existence, but a broad foundation on which new processes and new useful arts could be erected. When once this connection between science and art was fairly recognised, the theoretical and the practical proceeded together hand in hand; the theoretical saving the practical from many useless efforts and ridiculous failures, and the practical furnishing fresh facts to the theoretical for higher generalizations. This intimate relation between science and the useful arts is now so generally recognised, that every unprejudiced practical man must admit that he owes something to science. His own practice is, in fact, the result of scientific theory. He is probably practising that which fifty years ago existed only in books and memoirs.

"England has just reason to be proud of her scientific, as well as of her so-called practical men; of Newton, Priestley, Cavendish, Black, and Davy, as well as of Smeaton, Brindley, Arkwright, Telford, and Watt; and as the labours of the one merge into and assist the progress of the other, it would evidently be improper, even if it were possible, to confine the details of a work devoted to the useful arts to those of a merely practical character. If such a course were to be attempted, we might succeed in bringing before the reader a vast collection of facts, but he would miss the tie (the scientific principle) which connects and binds them together. Isolated facts form the gossip of science and the useful arts; facts, connected by principles, constitute their logical reasoning."

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

BURLEIGH, BENJAMIN of the Great Northern Railway, King's-cross. *Improvements in railway switches and chairs.* Patent dated January 9, 1854. (No. 45.)

This invention consists in forming the tongue-rail of a switch, with a bearing surface for the flanches of the wheels, when passing, to run on, so that the shocks consequent on the peripheries of the wheels coming against the fixed rail of a switch may be prevented. The inventor forms the chairs of such switches, &c., of wrought iron by rolling it and pressing one side, so as to receive a double-headed rail, and makes a hinge chair of wrought iron, the hinge being formed of straps, bolted to the main rail, strutting tubes being interposed to give stiffness.

TILGHMAN, RICHARD ALBERT, of Philadelphia, United States, chemist. *Improvements in treating fatty and oily matters chiefly applicable to the manufacture of soap, candles, and glycerine.* Patent dated January 9, 1854. (No. 47.)

This invention mainly consists of a mode "of obtaining free fat acids, and a solution of glycerine from those fatty or oily bodies of animal and vegetable origin, which contain glycerine as their base." For this purpose the inventor subjects these bodies to

the action of water at a high temperature, under pressure, so as to cause their elements to combine with water, thus effecting the production of free fat acids and glycerine solution.

HUSBAND, RICHARD, of Manchester, Lancaster, hat manufacturer. *Certain improvements in the method of ventilating hats or other coverings for the head.* Patent dated January 9, 1854. (No. 48.)

The inventor claims the use of a second band-lining, placed in the interior of hats or other coverings for the head, so secured as to preserve a space between it and another lining for the purpose of affording a passage for currents of air, which are intended to pass out of an orifice in the top.

GARFORTH, WILLIAM, and JAMES GARFORTH, both of Dukinfield, Chester, engineers. *Certain improvements in mechanism or apparatus for retarding or stopping the motion of locomotive engines and other railway carriages.* Patent dated January 9, 1854. (No. 49.)

The inventors claim an arrangement by which a portion, or all the weight of a locomotive railway engine is transferred from the wheels to supports attached to the framing, for the purpose of retarding or stopping its motion, by means of the direct action of pistons and cylinders actuated by the force of steam, air, or other fluid.

TYER, EDWARD, of Rhodes - terrace, Queen's-road, Dalston, Middlesex, electrical engineer. *Improvements in giving signals on railways by electricity, and in instruments and apparatus connected therewith.* Patent dated January 10, 1854. (No. 52.)

This invention comprises sundry features, of which the main is, that the wheels of an engine or carriage passing over a certain described apparatus impart motion to instruments, called "connectors," whereby electric circuits are closed, broken, reversed, or coupled up, and are made to act upon other electro-magnetic instruments, included in the same circuit, and thus communicate signals.

BROWN, WILLIAM, of Bradford, York, mechanic. *Improvements in preparing to be spun wool and other fibrous material.* Patent dated January 10, 1854. (No. 53.)

*Claim.*—The application of thin broad teeth or blades with pointed ends, actuated so as to be capable of striking in rapid succession through slivers, slubbings, or rovings of wool, or other fibrous material, for the purpose of removing noil knots and small lumps, or other matters therefrom.

BOYER, ANTOINE MARIE EDOUARD, ELIE DUCROS, and OSSIAN VERDEAU, of Paris, France. *Certain improved compounds to be used in dyeing.* Patent dated January 10, 1854. (No. 54.)

*Claim.*—The use (for the purpose of dyeing) of—"*Firstly.* All acids united in a diluted state with alkaline bases, such as soda, potash, and ammonia, thus forming substances of a novel composition. *Secondly.* The use of prepared proto-nitrate oı tin, and generally of all kinds of tin salts in a state of protoxides."

BOWDITCH, THE REV. WILLIAM RENWICK, of Wakefield, York, clerk, bachelor of arts. *Improvements in economizing fuel, and in the more economical production of light and heat.* Patent dated Jan.10, 1854. (No.55.)

The inventor introduces the air necessary for the purposes of combustion through a flue or flues, or a series of pipes or flues, fitted in connection with the furnace, delivering it upon the burning fuel in a highly heated state at the end of the furnace nearest to the door, the fuel being pushed gradually from the front to the back of the furnace. He also applies to gas-lights an external chimney for the purpose of heating the air which is supplied to them.

BOWDITCH, the Rev. WILLIAM RENWICK, of Wakefield, York, clerk, bachelor of arts. *Improvements in the purification of gas, and in the application of the materials employed therein.* Patent dated January 10, 1854. (No. 56.)

*Claims*—1. The purification of coal and other illuminating gas by the use of clay or aluminous earth employed either alone or in combination with lime. 2. The employment of the clay or aluminous earth as a manure or fertilizing agent, after it has been used in the purification of gas.

TOWNSEND, ELMER, of Boston, Massachusetts, United States. *Improvements in machinery for sewing cloth, leather, or other material.* (A communication.) Patent dated January 10, 1854. (No. 57.)

*Claim.*—The employment of a reversed hooked recess made in the side of the needle, in combination with a method of arranging a hook, so that in order to seize the loop of the needle it shall turn in a plane, situated longitudinally with respect to the axis of the needle.

MITCHELL, ALEXANDER, of Belfast. *Improvements in propelling vessels.* Patent dated January 10, 1854. (No. 58.)

The inventor says, "The blades or arms of my propeller I curve throughout their entire length, commencing where they spring or radiate from the central axis, and ending at the outer verge, the said curve not being the segment of a circle, but increasing or becoming more hooked as it approaches the periphery."

DREVELLE, ADOLPHE, of Halifax, York, merchant. *A new combing-machine, suitable for any textile or fibrous matter.* Patent dated January 10, 1854. (No. 60.)

This combing-machine consists of a circular grating or grate, a cylinder provided with comb-teeth or points, and worked eccentrically within the grate, and an eccentric nipping hoop or ring, so combined together as to allow the fibrous matter to be opened and properly held to be combed by means of a small cylinder covered with comb-teeth of various sizes, and by other combing instruments. The fibrous matter is supplied from bobbins placed on a creel or frame fixed over the circular grate and revolving with it, and after being combed and separated from the noil is detached from the circular comb by means of two straps, which deliver it to a vertical wheel covered with comb-teeth, from which it is either taken in the form of a sheet, or passes to a set of regular gill-boxes, and thence falls into a can.

TIZARD, WILLIAM LITTELL, of Aldgate, London, engineer. *Machinery for stamping, crushing, washing, and amalgamating gold and other ores.* Patent dated January 10, 1854. (No. 61.)

A full description of this invention was given in vol. lx. page 241.

MASSON, AMBROISE AUGUSTE, of Paris, France, manufacturer. *Improvements in the manufacture of thread or wire to be used for making gold or silver lace.* Patent dated January 11, 1854. (No. 62.)

*Claims.*—1. A mode of gilding or silvering that part of the surface of the wire or thread which is exposed to sight and to friction. 2. A mode of rendering the silk impermeable, or nearly so, so that it will not absorb a part of the bath.

WATSON, JOSEPH JOHN WILLIAM, of Old Kent-road, Surrey, doctor of philosophy. *Improvements in signalling.* Patent dated January 11, 1854. (No. 63.)

The inventor forms a box, the interior of which he paints white, and the back of which he covers with tin foil, and in this places a shelf, on which he stands an electric lamp, or other illuminating apparatus, introduced through a closely fitting door. In the front of the lamp, within the box, he fits a moveable disc, perforated with circular holes round its circumference, and across one of its diameters; and in connection with this disc, shutters are fitted in such manner that part, or the whole of the holes, in the disc may be either covered or opened, and signals thus communicated.

WATT, WILLIAM, of Glasgow, Lanark, chemist. *Certain improvements in the application of heat to drying purposes.* Patent dated January 11, 1854. (No. 66.)

*Claim.*—The construction of a long reverberatory furnace with transverse pipes, fitted with faucet joints in connection with a drying chamber, through which passes a current of air, heated by passing through the said pipes.

BAUWENS, FELIX LIEVEN, of Pimlico, Middlesex, manufacturer. *Improvements in treating fatty matters previous to their being employed in the manufacture of candles.* Patent dated January 11, 1854. (No. 67.)

*Claims.*—1. The treatment of neutral or unfinished acidified fatty matters by saponification with soda, for the express purpose of producing fatty acids to be used in the manufacture of candles; and the use of a solution of sulphuric acid for decomposing such soap, the solution being so concentrated as to produce crystallized sulphate of soda by the cooling of the separated waters. 2. The peroxidation of the oxide of iron, which exists in fatty acids or neutral fatty matters, by injecting oxygen or air into the same, and thereby facilitating its combination with acids; also treating the fatty acids and neutral fatty matters treated as above by injected oxygen or air, with a solution of any vegetable principle capable of producing ink with oxide of iron, so as to render such fatty matters purer and lighter in colour, and better fitted for the manufacture of candles. 3. The use of injected air, oxygen or sulphurous gas, in the acidification of fatty bodies with concentrated sulphuric acid, for the purpose of facilitating the acidifying process, and preventing the agglomeration of glycerine.

LISTER, RALPH, of Scotswood, Northumberland, brick-maker. *Improvements in distilling apparatus.* Patent dated January 11, 1854. (No. 69.)

This invention relates to such stills as are conveniently made of earthenware, or other plastic or fictile materials, or of glass, and consists in forming them with an encircling worm or spiral channel in their sides.

VETILLART, MARCEL, of Le Mans, France. *Improvements in drying woven fabrics, yarns, and other goods.* Patent dated January 11, 1854. (No. 70.)

The inventor constructs a drying chamber of any suitable dimensions, so arranged that the goods to be dried enter into it at the upper, and pass out at the lower part; by which means the heated air which enters the chamber at its lower part is caused to act first on those parts of the goods which are already considerably dried, and then successively on others which are less so.

LEESON, HENRY BEAUMONT, of Greenwich, Kent, M.D. *Improvements in gas-burners.* Patent dated January 11, 1854. (No. 71.)

The object of this invention is to obtain a more convenient means of combining air with gas in a gas-burner. For this purpose the burner is constructed with numerous small passages at the upper part, where the

gas mixed with air is burned. The burner is hollow, and the lower part is open, but capable of being closed, more or less, by a conical or other suitable valve fitted on the tube which introduces the gas. The burner is caused to rise and fall by means of screws, and thus regulate the supply of air.

TUSSAUD, FELIX, engineer, of Paris. *An universal pump-press, with continuous action, called "Continuous Producer."* Patent dated January 11, 1854. (No. 72.)

*Claim.*—"The application of one or more chains, racks, or wheels, with moveable teeth gearing with one or more screws or worms inclosed in a vessel of any form, which, by their combined motions above described, may be made to act either as a continuous pump or as an universal continuous press."

BOAKE, JOHN FULLER, of Dublin, lampist to the Great Southern and Western Railway of Ireland. *Improvements in and applicable to certain lamps or lanterns, so that either candles or oil may be used therein with facility.* Patent dated January 12, 1854. (No. 78.)

This invention relates mainly to lamps used in railway trains, and commonly known by the names of tail and side lamps, and consists in the construction of the lamp or lantern in such manner that the oil burner, which is ordinarily used, may be easily removed, and a candle, tube, or holder substituted for it, and *vice versâ.*

PARTRIDGE, JOHN WILLIAM, of Birmingham, Warwick, gentleman. *Certain improvements in the manufacture of soap.* Patent dated January 12, 1854. (No. 79.)

*Claim.*—Introducing into the manufacture of soap, linseed, rape, hemp, cotton, "or other seed of a similar nature, possessing like oleaginous and mucilaginous properties, or an extract or extracts from any or all of such seeds."

BETHELL, JOHN, of Parliament-street, Westminster, gentleman. *Improvements in manufacturing coke.* Patent dated January 12, 1854. (No. 80.)

This invention consists in making coke by mixing with coals or small pieces of coke the pitch obtained from coal tar, and then burning the mixture into coke in ordinary coke ovens, or in heaps; and also in making coke by burning pitch only in coke ovens.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, Holborn, London. *An improvement in the manufacture of glass.* (A communication.) Patent dated January 12, 1854. (No. 83.)

*Claim.*—"The manufacture of glass in a furnace in which the heat is produced by the combustion of gases which are generated in a chamber or chambers outside the furnace by forcing a current of air through a thick stratum of ignited fuel, and are conducted into the furnace by a flue through which a blast of air is forced with them."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex. *Improvements in the preparation of glycerine, and in its application.* Patent dated January 12, 1854. (No. 85.)

This invention relates to "the admixture of glycerine with fatty matters, alcohol, acetic acid, and water, with all of which it combines easily. It is proposed to employ glycerine in the manufacture of Hygienic vinaigres, cosmetics, toilette water, scented essences, and other articles of perfumery."

MACLAREN, ROBERT, of Glasgow, Lanark, engineer. *Improvements in moulding or shaping metals.* Patent dated January 12, 1854. (No. 86.)

*Claims.*—1. A general described arrangement of machinery. 2. A mode of producing the requisite degree of compression in the sand, loam, or other material of which moulds for casting metals are composed, at one or more operations, by the application of great pressure exerted over the entire mass of material of the mould, or section of mould, under treatment.

PARSEY, ARTHUR, of Crescent-place, Burton-crescent, St. Pancras, Middlesex. *Improvements in machinery for obtaining and applying motive power by means of compressed air and other fluids.* Patent dated January 13, 1854. (No. 88.)

*Claims.*— 1. "The combination of a hollow piston-rod with a hollow piston, having a valve or valves opening upwards, and a valve or valves opening downwards, for the purpose of admitting air both above and below the piston of an air-pump." 2. "The construction of end valves of an air-pump, so as to cover the whole of the end of the cylinders to which they are applied." 3. The construction of an air-pump with a series of cylinders progressively diminishing in capacity. 4. "A mode of constructing an ærometer of a moveable weighted reservoir, for receiving air or water to be pressed into it, and for again giving out the same under pressure."

O'MALLEY, PATRICK, of Dublin, brewer. *The manufacture of a new drink or beverage from certain vegetables and other substances, and the conversion thereof into vinegar.* Patent dated January 13, 1854. (No. 89.)

A description of this curious beverage has been already published; see *Mechanics' Magazine*, vol. lix., page 77.

JEFFREYS, JULIUS, of Carlton-villas, Maida-vale, Middlesex. *Improvements in the manufacture of mineral charcoal and coke, and in adapting open grates for the combustion of them.* Patent dated January 14, 1854. (No. 94.)

The inventor proposes to cheapen the cost

of coke by applying the heat at present wasted in manufacturing it to the warming of hot-houses, conservatories, &c. For this purpose, the vent-flues from the coking-ovens are to pass along the surface of the ground, either by sinking the ovens sufficiently, or by causing the flues to descend to the level of the ground. The improvement in house-grates consists in dividing the chimney-ways connected with them into two by means of a diaphragm.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *A new and improved mode of propelling machinery.* (A communication.) Patent dated January 16, 1854. (No. 96.)

This invention consists in the employment of the vapour of bi-sulphuret of carbon in the place of steam, as a source of motive power. The inventor fills a boiler of an ordinary steam engine with this material, and applies heat to the boiler, or he fills the boiler partly full of water, and either injects the bi-sulphuret of carbon into the water, heated to any temperature above 108°, or he injects the bi-sulphuret of carbon into the steam generated from the water. "The vapour of the bi-sulphuret of carbon operates precisely as steam, for which, in fact, it is a substitute."

NEWALL, JAMES, of Bury, railway-carriage builder. *Improvements in machinery or apparatus for stopping or retarding the progress of railway and other carriages, and in the mode or method of connecting two or more carriages with the said apparatus together.* Patent dated January 16, 1854. (No. 98.)

*Claims.*—1. A method of working the inventor's self-acting break underneath the carriages or wagons, as well as at the top of them. 2. Working the same either from the tender or any carriage in the train. 3. Several modes of connecting the revolving longitudinal shafts. 4. A plan of making the said apparatus act as a signal. And, 5. The use of a joint in the rod or plate to which the break-block is attached, in any description of break.

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company. *An improvement in the manufacture of candles and night-lights.* Patent dated January 16, 1854. (No. 101.)

This invention consists in the employment of palmine or its acid in the manufacture of candles, either alone or in combination with other suitable matters. The inventor prefers "to subject the palmine or its acid to washing and boiling in water, and then, when desired, to subject it to a suitable process to separate the more solid from the more fluid part."

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company. *Improvements in treating castor-oil, and obtaining products therefrom.* Patent dated January 16, 1854. (No. 102.)

This invention mainly consists in subjecting castor-oil to the action of heat before or after submitting it to the action of hyponitric, nitrous, or sulphurous acid, by which the solidifying process is improved. The invention also consists of boiling palmine or palmic acid in water or acidulated water by the action of free steam.

*** The documents of Nos. 76 and 105 are with the Law Officers, under reference.

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

PETTITT, ZACHARIAH, of Fordham, near Colchester. *Improvements in thrashing machines.* Application dated January 9, 1854. (No. 46.)

This invention consists "in so forming and arranging that part of a thrashing machine commonly known as the 'concave,' that the internal ribs or parts next to the drum shall be arranged spirally or zig-zag, so as neither to be parallel nor at right angles to the beaters of the drum."

HOWSON, RICHARD, of Manchester, Lancaster, engineer. *Certain improvements in screw-propellers.* Application dated January 9, 1854. (No. 50.)

The primary feature of this invention consists in forming that part of the propeller blade which is nearest to the boss, so that it may pass with greater ease than is usual through the water.

TAYLOR, WILLIAM, of How-wood, Renfrew, North Britain, merchant. *Improvements in furnaces and fireplaces, and in the prevention of smoke.* Application dated January 9, 1854. (No. 51.)

In applying these improvements to a common steam boiler, the inventor forms one fireplace or furnace in the usual manner at the front of the boiler, and behind this a hollow bridge, through which air is passed from the external atmosphere to be heated and passed out at the back, through suitable apertures, to meet the gases and products of combustion from the front grate bars.

ENGLEDUE, JOHN RALPH, of Southampton, Hants, superintendent of the Peninsular and Oriental Steam Navigation Company, and THOMAS BURNINGHAM, of Millbrook, same county, clerk. *Improvements in furnaces.* Application dated January 10, 1854. (No. 59.)

This invention consists in fitting a fire-bridge or curtain to the top of the furnace, between the ordinary fire-bridge and the

front of the furnace, and in arranging a hopper for supplying the fuel, and a valve for regulating the admission of the air.

BENNETTSMITH, HENRY, of St. Sepulchre's, Middlesex, gentleman. *A machine for mowing or reaping all kinds of corn, grass, clovers, or any other field growth, and lawns.* Application dated January 11, 1854. (No. 64.)

Round the nave or hub of the wheels of this machine is a band "connected to a revolving spindle or shaft, the other extremity of which is inserted into the centre of a bevel wheel connected to two other lesser upright wheels; through the centre of each passes an upright shaft or spindle, causing to revolve in opposite directions two flat circular plates affixed to their lower ends, into which plates are inserted a number of cutting scythes or knives."

SEMPLE, DANIEL, of the 1st Bombay European Regiment Fusiliers, now at Aden, South Arabia. *An improved guide for the finger-boards of musical stringed instruments.* Application dated January 11, 1854. (No. 65.)

This invention consists in the use and employment of notched projecting pieces fixed to the finger-boards of musical stringed instruments, at those places where the strings are required to be stopped.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in extracting gold from the ore.* (A communication.) Application dated January 11, 1854. (No. 68.)

This invention consists—1. In the employment of a current of electricity to aid in forming and depositing the amalgam. 2. In the application of a plate of gold, or of a golden surface to the bottom of the amalgamating vessel. And—3. In a method of discharging the gold directly into the mercury and diffusing it throughout the mass, by means of a spout or tube revolving in it.

PONÇON, ANTOINE, of Marseilles, France. *Obtaining a motive power.* Application dated January 11, 1854. (No. 73.)

This invention consists "in using the sun's rays to create a vacuum in a suitable vessel elevated at the height of a column of water, which in the above vacuum is kept in equilibrium by the pressure of the atmosphere. Such vacuum being formed, I fill it with water acted upon by the external pressure of the atmosphere, and thus obtain a head of water which may be applied as motive power."

WREY, JOHN WILLIAM, of Upper Berkley-street West, Middlesex, esquire. *A new and improved method of transmitting motion.* Application dated January 12, 1854. (No. 74.)

This invention consists in "the employment of rods or arms connected by hinges to the ends of levers, and to one another by ball and socket or other suitable joints, so as to form angles with the levers and with one another, which shall vary as the levers are moved, by means of which rods or arms and hinges motion may be transmitted from one lever to another."

WALLER, THOMAS, of Ratcliff, Middlesex, ironmonger. *Improvements in register stoves and other stoves or fireplaces.* Application dated January 12, 1854. (No. 75.)

This invention consists in a method of arranging the grates of stoves, by which the size of the fuel-space can be altered at pleasure; and likewise in a peculiar mode of joining the metal plates or bricks, of which fireplaces are formed.

SERF, JOSEPH, of Paris, France, gentleman. *Improvements in seats or chairs for advertising.* Application dated January 12, 1854. (No. 77.)

The provisional specification merely states the object of the invention to be the affixing of advertisements upon seats and chairs.

ANGER, LEON JOSEPH, mechanician, of Paris, France. *Improvements in the manufacture of metallic tubing.* Application dated January 12, 1854. (No. 81.)

The inventor proposes to make tubes of short lengths, and to elongate or finish such tubes by the use of steel mandrils of the full length that the tube is intended to be when perfected.

HENLEY, THOMAS FREDERICK, of Cambridge-street, Pimlico, Middlesex, merchant. *Improvements in the preparation of certain colouring materials.* Application dated January 12, 1854. (No. 82.)

The inventor prepares a red colouring material from "stick or other lac," by digesting it in an aqueous solution of ammonia, from which the whole or part of the ammonia is afterwards evaporated, leaving the colouring material in solution in the water. This solution is then employed in dyeing or printing with suitable mordants, or it may be evaporated to dryness, and the dry colouring material be dissolved again when required for use. He also dries and powders the "awl" that is obtained in British India, and treats it with sulphuric or muriatic acid.

WILKES, SAMUEL, of Wolverhampton. *Improvements in the construction of chairs and rails for railways.* Application dated January 12, 1854. (No. 84.)

The inventor forms joint-chairs in such manner that there is in each a bearing across it to receive the end of the rail, which is notched, or cut out to fit the bearing; and in order that the chairs may better support the rails, the two jaws or cheeks of each are formed to slide on to the

ends of the railway bars, so as not to require wedging.

EASSIE, WILLIAM, of Gloucester, railway contractor. *Improvements in trucks used on railways.* Application dated January 13, 1854. (No. 87.)

The inventor proposes to improve the poles employed for connecting trucks used on railways for the carriage of timber, &c., by providing such poles with springs of India-rubber or other suitable elastic material, so that the force of the shock occasioned by the sudden starting or stoppage of the train may be prevented from injuriously affecting them.

FOULKES, THOMAS BENNETT, of the firm of ABEL and THOMAS BENNETT FOULKES, of Chester, glove manufacturers. *Improvements in the manufacture of self-adjusting gloves.* Application dated January 13, 1854. (No. 90.)

This invention consists in manufacturing gloves with a gore of elastic material inserted at the wrist.

WILKINSON, JOHN, of Manchester, Lancaster, die-maker. *Improvements in the manufacture of dies for producing printing surfaces for calico-printers, applicable also to embossing.* Application dated January 13, 1854. (No. 91.)

This invention mainly consists in a method of using the instrument called the pantograph for the purpose of etching designs upon surfaces of metal to be used for impressing the said designs upon rollers or dies from which printing or embossing surfaces are formed.

NEWMAN, JAMES, jeweller, and HENRY JENKINS, die-sinker, stamper, and piercer, both of Birmingham, Warwick. *Improvements in the manufacture of spoons, table-forks and other articles.* Application dated January 14, 1854. (No. 92.)

This invention consists of an improved method of forming the blanks for spoons, table-forks, and other articles, from sheets or plates of metal suitably prepared, so as to obviate the necessity of beating out or cross rolling those parts which are intended for the bowls and handles.

BIRD, JAMES, of St. Martin's-lane, Westminster, mechanic. *An improvement in taps or cocks.* Application dated January 14, 1854. (No. 93.)

This invention consists in providing slightly-yielding seats for the plugs of taps and cocks to work in, in order to avoid the grinding of the surfaces.

DOBSON, ARTHUR, of Bolton-le-Moors, Lancaster, commission-agent. *Certain improvements in looms for weaving.* Application dated January 14, 1854. (No. 95.)

These improvements consist in giving motion to the vibrating rail of looms from the tappet or other shaft which communicates motion to the heddles.

CROSSKILL, WILLIAM, of Beverley, York, civil engineer. *Improvements in the construction of portable railways.* Application dated January 16, 1854. (No. 97.)

This invention consists—1. In making a railway of bridge rails, longitudinal sleepers, and cross pieces, bolted together in lengths so that each length is portable; and 2. In a method of fastening together the ends of the several lengths by sockets and bolts, so that they form one continuous line.

GRANT, PHILIP, of Manchester, Lancaster, stationer and letter-press printer. *An improved roller used in the processes of letter-press, copper-plate, and lithographic printing.* Application dated January 16, 1854. (No. 99.)

The inventor proposes to cover printing rollers with caoutchouc or some similar material.

BLAKER, PETER, of Crayford, Kent, brick merchant, and WILLIAM WOOD, of Chancery-lane, London, Middlesex, civil engineer. *A machine for crushing coal, and the refuse arising from the combustion of coal used for brick-making and other purposes.* Application dated January 16, 1854. (No. 100.)

This machine consists of "metal rollers either with plain surfaces or indented, or revolving bars with projecting teeth, knives, or scarifiers, to all or either of which a rotary motion is given."

JULYAN, PENROSE GOODCHILD, of Bath-street, Birmingham. *Improvements in communicating signals to engineers, guards, and others in a moving railway train.* Application dated January 16, 1854. (No. 103.)

The inventor describes certain apparatuses formed with an arm or projection, which, being turned across the railway, will, when a train is passing under it, come in the way of a trigger or instrument in connection with the steam-whistle, and cause the whistle to be opened, and as the train moves onward, bells or signal instruments carried by the goods carriages to be sounded.

SPIRES, JOSEPH, of Lower Drummond-street, Euston-square, Middlesex, gun-maker. *Improvements applicable to boots and shoes.* Application dated January 16, 1854. No. 104.)

The inventor describes a spring clamp which is made to fit a rotating heel, so that by pressing the two jaws of the clamp together, they will be made to firmly embrace the heel, and enable the wearer to turn it.

## PROVISIONAL PROTECTIONS.

*Dated June 21, 1854.*

1358. Henry Dembinski, General, of Rue Joubert, Paris, France. Improvements in heating-apparatus.

*Dated July 3, 1854.*

1448. John Kolbe Milne, of Edinburgh, Midlothian, Scotland, pocket-book maker. An improved means of holding letters, documents, or other similar articles.

1449. Benjamin Walters, of the firm of Benjamin and Philip Walters, of Wolverhampton, Stafford, lock-manufacturers. Improvements in spindles for locks and latches, and in the means of adjusting knobs to the same, to suit any thickness of door.

1450. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in stopping bottles, and in drawing off aërated or other liquids contained therein. A communication.

1451. Walter Greenshields, of Edinburgh, Midlothian, manager. Improvements in chenille fabrics.

1452. William Balk, of Ipswich, Suffolk. An improved friction dynamometer.

1453. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in the construction and arrangement of marine steam engines. A communication.

1454. Joseph Hopkinson the younger, of Huddersfield, York, engineer. Improvements in steam boilers and furnaces, and in apparatus connected therewith.

1455. Edouard Auguste Desiré Guichard, of Paris, France, designer. Improvements in ornamenting the surfaces of various articles and fabrics.

1456. Urbain Chauveau and Charles d'Epinois, both of Paris, France, civil engineers. Improved means or apparatus for preventing collisions on railways.

*Dated July 4, 1854.*

1457. Joseph Sunter, of Derby, engineer. New or improved drilling-machinery.

1459. Christopher Thomas Tiffany, of Leeds, York. An improvement in the manufacture of brushes used in gig mills and machinery for brushing piled fabrics.

1460. Thomas Haimes, of Melbourne, near Derby. Improvements in the manufacture of gloves and mits by warp machinery.

1461. John McGaffin, of Liverpool, Lancaster, engineer. Improvements in corrugated cast iron.

1462. Jean André Cécile Nestor Delpech, mechanist, of Castres, in the French Empire. An improved lift and force-pump, called "Castraise Pump."

1463. James Newman, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of metallic rods, rails, and bars.

1464. Joseph Marie Bardet, chemist, and François Collette, manufacturer, both of Paris, France. An improvement in the construction of matches.

1465. Richard Garrett and Richard Garrett, jun., of Leiston Works, near Saxmundham, Suffolk, agricultural implement-makers. Improvements in machinery for drilling seed and manure.

1466. George Daniel Bishopp, of Inverness-terrace, Middlesex, civil engineer. Improvements in the construction and arrangement of engines to be driven by steam, air, gases, or water.

1467. Thomas Elliott, of Manchester, Lancaster, engineer. Improvements in safety valves and apparatus connected therewith, which valves may also be used as steam-valves.

1468. Henry Heycock, of Manchester, Lancaster, merchant. Certain improvements in hydraulic presses employed for packing or pressing cotton, silk, flax, wool, or other fibrous materials.

1469. David Bowlas, of Reddish, Lancaster, manufacturer. Certain improvements in machinery or apparatus for knitting or manufacturing healds or harness used in looms for weaving.

1470. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in obtaining motive power. A communication from Jacques Eugene Armengaud, of Paris, France, civil engineer.

1471. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. An improved system or mode of coating iron with copper. A communication from Edmond Charles Bocquet, of Corbehem, France, manufacturer.

*Dated July 5, 1854.*

1472. Louis Joseph Cheval, of Raismes, France. Improvements in beer-engines.

1473. Joseph Burch, of Crag hall, near Macclesfield, Chester. Certain improvements in marine and other steam engines.

1475. Thomas Restell, of the Strand, Westminster, chronometer-maker. An apparatus or holder for holding parcels of gloves and other goods and papers.

1476. William Symes, of Pimlico, Middlesex, gentleman. Improvements in tills.

*Dated July 6, 1854.*

1480. John Glasgow, of Manchester, Lancaster, engineer. Improvements in machinery or apparatus for cutting, compressing, punching, shearing, and shaping metals.

1482. Otis Avery, of Castle-street, London. Improvements in sewing and stitching-machines.

1484. John Lamb, of Newcastle-under-Lyne, Stafford, paper-manufacturer. Improvements applicable to machines for cutting paper.

1486. John Radcliffe, of Stockport, Chester, machinist. Certain improvements in power-looms for weaving.

1488. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in electro-magnetic engines. A communication from Thomas C. Avery, of New York, United States of America.

1492. John Petrie, jun., of Rochdale, Lancaster, ironmonger. Improvements in machinery or apparatus for washing or scouring wool.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1520. William Eassie, of Gloucester, railway-contractor. Improvements in trucks used on railways. July 12, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," July 25th*, 1854.)

577. John Buchanan. An improvement in communicating motion to or from the ordinary crank or an eccentric.

620. Laurence Whitaker and Greenwood Lyons. Certain improvements in grinding or setting the main cylinder of carding engines used for carding cotton and other fibrous materials.

629. Robert Weare. Improvements in the construction of galvanic batteries and apparatus connected therewith.

644. George Waide Reynolds. A new or improved fabric to be used in the manufacture of stays or corsets.

646. John Hick. Improvements in apparatus for heating the cylinders of steam engines.

648. William Dantec. Improvements in purifying water.

653. John Bird, junior. Improvements in the manufacture of silk into threads required for woven fabrics for sewing and for other purposes, and in machinery to be used for these purposes.

657. Joseph Horton and Richard Jenkin Polglase. Improvements in the construction of ships, boilers, girders, tanks, gasometers, and other like structures or vessels.

658. Claude Adrien Bernard Chenot. Improvements in the manufacture of steel, iron, and different alloys, cast, welded, and moulded.

660. John Longbottom. Improvements in combining atmospheric air with hydro-carbons for the purposes of light and heat. A communication.

665. William Stevens and William Stevens, junior. A new or improved machinery for grinding and polishing lenses.

669. Richard Roberts and George Coppock. Certain improvements in looms for weaving.

677. John Healey, John Foster, and John Lowe. Improvements in certain parts of machines used for preparing, slubbing, and roving cotton and other fibrous materials.

678. John Horsfall Robinson. Improvements in steam boilers.

685. Laurence Whitaker and Doctor Ashworth. Certain improvements in power looms for weaving.

693. Benjamin Fothergill and William Weild. Improvements in obtaining and preparing the fibres of plantain penguin and other vegetable substances for manufacturing purposes.

699. James Robertson. Improvements in lifting or transporting heavy bodies.

714. Alfred Hodgkinson. Improvements in bleaching linen fabrics.

717. William Hähner. Improvements in the manufacture of muriatic and sulphuric acids. A communication.

719. William Hähner. Improvements in the manufacture of alkaline sulphites, and in purifying and treating gases. A communication.

721. John Henry Johnson. Improvements in the construction of millwork, and in the mode of driving the same, part of such improvements being applicable for transmitting motive power generally. A communication from Henri Fortuné Negrier, of Toulouse, France.

745. Frederick Samson Thomas. Certain improvements in locomotive engines.

771. Bernhard Samuelson. Improvements in machinery for cutting turnips and other vegetable substances.

778. Henry Blatter. An improved mode of constructing thermometers.

800. Julian Bernard. An improved mode of stitching or uniting and ornamenting various materials, and in machinery or apparatus for the said purpose.

1270. Thomas Richardson. Improvements in the manufacture of alum.

1339. Henry Worrall. Improvements in machinery or apparatus for carding cotton, wool, or other fibrous materials.

1379. Isaac Farrell. Improvements in fireproof flooring and roofing, which improvements are also applicable to the construction of walls and bridges and other like structures.

1386. Thomas Rudd. Improvements in stands for casks or barrels.

1448. John Kolbe Milne. An improved means of holding letters, documents, or other similar articles.

1451. Walter Greenshields. Improvements in chenille fabrics.

1453. Alfred Vincent Newton. An improvement in the construction and arrangement of marine steam engines. A communication.

1458. Alexander Southwood Stocker. Certain improvements appertaining to match-boxes, and in the fitting, stoppering, and covering of tubes and other vessels of glass, porcelain, and other materials.

1460. Thomas Haimes. Improvements in the manufacture of gloves and mits by warp machinery.

1461. John M'Gaffin. Improvements in corrugated cast iron.

1463. James Newman. Improvements in the manufacture of metallic rods, rails, and bars.

1465. Richard Garrett and Richard Garrett, junior. Improvements in machinery for drilling seed and manure.

1467. Thomas Elliott. Improvements in safety-valves and apparatus connected therewith, which valves may also be used as steam valves.

1480. John Glasgow. Improvements in machinery or apparatus for cutting, compressing, punching, shearing, and shaping metals.

1513. Paul François Aerts. Improvements in constructing parts of railway rolling stock, and in the lubrication thereof.

1520. William Eassie. Improvements in trucks used on railways.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## PORTER'S IMPROVEMENTS IN ANCHORS.

A petition will be presented to Her Majesty in Council by Mary Honiball, of St. John's-wood, widow, praying Her Majesty to confirm the letters patent granted to her on the 9th February, 1853, for "improvements in anchors," or to grant new letters patent for the same invention, for which William Henry Porter, of Russia-row, Milk-street, Cheapside, in the City of London, warehouseman, obtained letters patent on the 15th August, 1838. An application will be made on the 29th August next to the Judicial Committee of the Privy Council (or so soon after as their lordships shall be sitting) to fix a day for hearing the matters contained in the said petition; and all persons desirous of being heard in opposition, must enter a caveat at the Privy Council-office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed July* 21, 1854.

171. Richard Archibald Brooman.
199. George Firmin.
223. William Hodgson.
241. Pierre Joseph Meeus.
255. John Jobson and Robert Jobson.
273. William Longmaid and John Longmaid.
309. John Ramsbottom.
513. Thomas Dawson.
591. James Wright.
819. William Rigby.
845. Edward Lavender.
1001. James Nasmyth.
1051. Warren de la Rue.
1065. Moses Poole.
1087. Thomas William Miller.
1109. James Colley March.

1117. Edouard Auguste Désiré Guichard.
1171. Allan Livingston, jun.
1173. Gardner Chilson.
1175. Mahlon Loomis.

*Sealed July* 25, 1854.

204. Henry Tendall and William St. Clair Trotter.
207. William Partington.
242. William Malam.
246. Claude Bernard Adrien Chenot.
280. William Little.
286. Robert James Maryon.
337. John Jennings the younger.
447. Charles Cowper.
454. Thomas Forsyth.
498. Thomas Henry Ewbank.
710. George Collier.
912. George Jones.
1062. Moses Poole.
1064. Moses Poole.
1090. Thomas William Miller.
1138. Andre Prosper Rochette.
1174. Samuel Sweetser.
1197. Michael Scott.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

*R. H. S.*—We will answer your questions as fully as possible in our next.

*F. Briggs*, Huntingdon.—We regret that we cannot comply with your somewhat inconsiderate request. An excellent and comprehensive article on "Gas-light," in the last edition of "Ure's Dictionary," will probably furnish you with all you require.

CONTENTS OF THIS NUMBER.



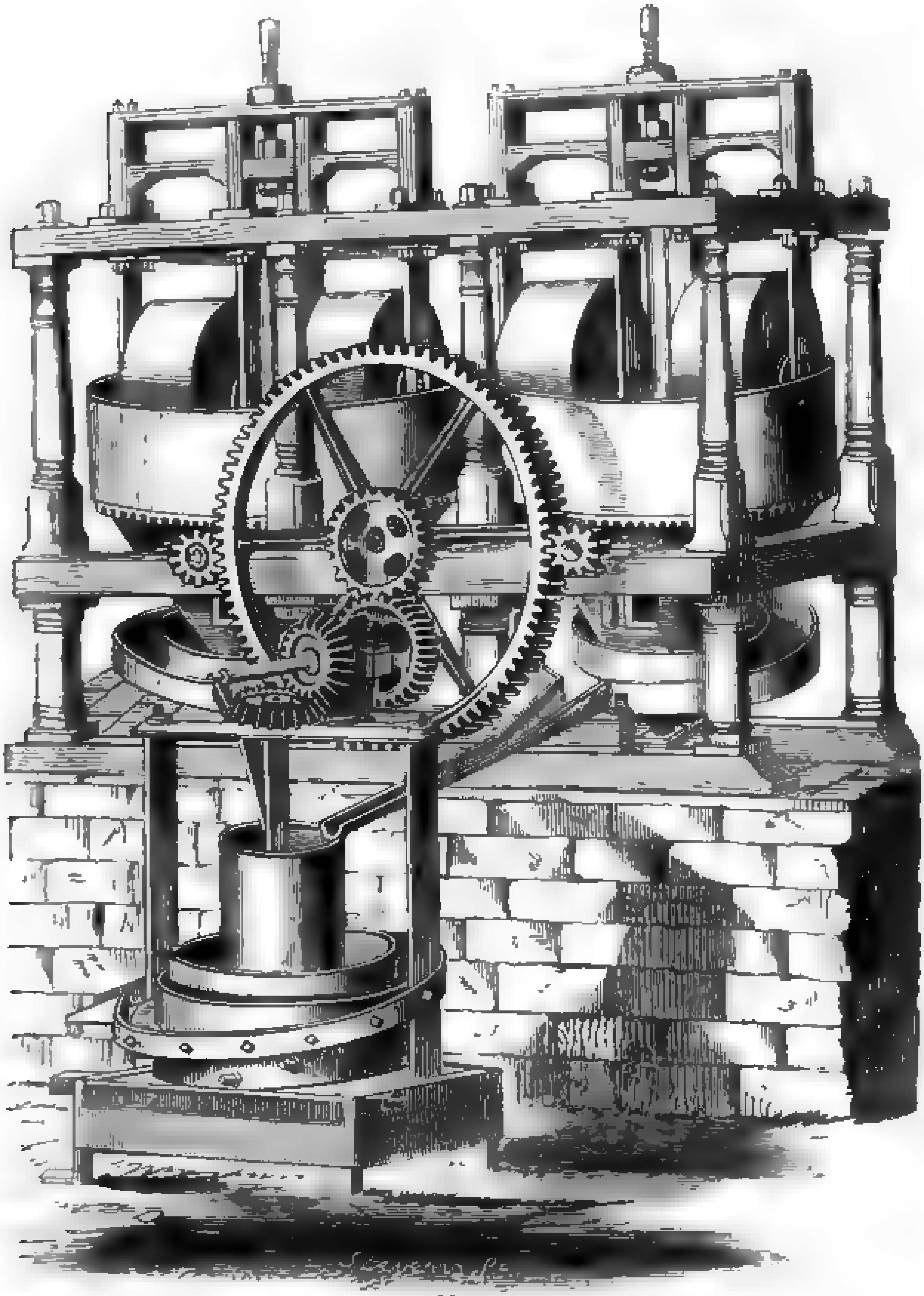
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No 1617.] SATURDAY, AUGUST 5, 1854. [Price 3d Stamped 4d

Edited by R. A. Brooman, 166, Fleet-street.

WESTLAKE'S PATENT GOLD-MILL AND AMALGAMATOR.



## WESTLAKE'S PATENT GOLD-MILL AND AMALGAMATOR.

(Patent dated July 21, 1854.)

THE engraving on the preceding page represents a perspective view of a mill and amalgamator invented by Mr. Westlake, mine-agent, of Newton Abbott, Devon. The machine is intended to crush and amalgamate gold ores, gossans, quartz, &c., at the same time and at one operation. It consists, as will be seen on reference to the engraving, of iron troughs or basins, which are made to revolve upon vertical shafts at the rate of about sixty revolutions a minute, by means of the cog-wheels and handle shown, or by cog-wheels and a drum, round which a driving-band is passed. These troughs or basins carry in them two or more heavy rollers, which work on axes capable of moving freely up and down in slots formed in the framework of the machine, so that they are at all times free to press with their entire weight upon the bottoms of the basins, or upon the matters which they contain. These rollers are driven by the friction arising from the motion of the troughs. The materials to be operated upon are fed into the troughs, together with a portion of mercury, and a quantity of water is supplied by pipes fixed in any convenient position. The sides of the basins are made to slope towards the bottoms, which are precisely of the same breadth as the rollers, so that the materials in the troughs will, of necessity, fall to the bottom, and there be overtaken and crushed by the rollers, which are formed either of stone or of cast iron, and weigh about three tons each.

The amalgamator is a separate machine, but is connected to the mill by a shoot or pipe, which conveys the whole of the ground material in solution into the receiver, where it is compelled to pass through heated and disturbed mercury by a mechanical process, which produces a constant contact of the solution with a new and unbroken surface of mercury; the solution then overflows into a waste shoot in such manner that no quicksilver or amalgam is allowed to escape. The basins are provided with pipes fixed on their sides at intervals, to carry off the waste water and pulverized solution, which is received in troughs fixed below on supports. These pipes can be raised, depressed, or fixed by set screws at any required height. By this arrangement the person in charge of the machine is enabled to draw off the solution in different degrees of fluidity dependent upon the height of the orifices or tops of these pipes above the bottoms of the basins, where the mercury, and heavier, or least pulverized portions of the ore are always to be found.

## NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S., and Corresponding Member of the Manchester Literary and Philosophical Society.)

NO. III.

(*Continued from vol. lx., page 438.*)

THE Rev. William Crakelt has been already noticed as the intimate friend and associate of the Rector of Swanscombe. He had formed an acquaintance with the latter at an early period of his connection with the periodicals, and very frequently each may be found more than usually vigilant in answering the questions proposed by the other. In the *British Oracle* the Rev. John Lawson occasionally appears under the signature "J. L.," and in the pages of the *Miscellanea Mathematica Curiosa* we find the Rev. William Crakelt somewhat slightly disguised by the title of "William Chartreux;" a signature most probably adopted in reference to his then holding the office of Mathematical Master at the Charter-house School, London. Throughout the whole of the mathematical career of these two noted geometers there appears to have existed the most perfect cordiality. We never find them in antagonism, even in those periodicals which too frequently afforded an arena for unseemly strife; and the following letter will show that, so far as regarded mathematical subjects, there did not even exist that reserve which one would be led to expect when *both* perhaps contemplated publication, and when *both* were certainly in a position to take advantage of each other's researches in subjects relating to pure geometry:

"Charter-house, Oct. 3rd, 1768.

"Dear Sir,—This afternoon I took a second walk to the Museum with a view of knowing the result of my application last Wednesday, but was unfortunately put off with tickets for next Monday; those for Friday having been previously requested. I shall keep them, however, until you come to town, though I am afraid you will deem them quite unseasonable. *I have herewith sent you a small parcel of mathematics, being my lucubrations that way since schooling commenced.* How many of the problems *are original and worth preserving*, I hope you

will frankly tell me the first time I have the pleasure of seeing you. On Thursday evening I am apprehensive I shall be too much engaged to meet you anywhere, but shall spend the little time I have on Friday afternoon in your company, should you not be otherwise engaged. In the interim, believe me most unfeignedly yours,

"WILLIAM CRAKELT."

"The Rev. John Lawson,
"Swanscombe, Kent."

In my paper "On the Lancashire Geometers and their Writings," just printed in the eleventh volume of the "Memoirs of the Literary and Philosophical Society" of Manchester, I have shown that Mr. Lawson was in constant correspondence with several of the able geometers then resident in Manchester, and that he submitted a manuscript volume of solutions for the inspection and corrections of Mr. Jeremiah Ainsworth. This manuscript contained various solutions by various authors to all the theorems and problems appended to his "Dissertation on the Geometrical Analysis of the Ancients," published anonymously in 1774; nor would its recovery and publication be without interest even at the present day, since we should then have another series of diversified solutions to those theorems and problems which engaged the attention of such geometers as Wildbore, Campbell, Lowry, Nicholson, and Swale. Much of Mr. Lawson's intimacy with the mathematicians of his day would no doubt arise from the fact of their corresponding to the same periodicals as himself; but considerable additions to his circle of friends must have resulted from the following singular announcement appended to the early copies of his dissertation:

"The Author of this publication, being a man of leisure, and living in a retired situation, remote from any opportunity of conversation with mathematicians, would be extremely glad of a correspondence with any such, who are willing to be at the expense of the same; or if this be thought too much, will pay the postage of his answers to their letters. But no letters, except post-paid, can be received by him; otherwise a door would be opened for frolic, imposition, and impertinence. Any new Geometrical Propositions, either Theorems or Problems, would be received with gratitude, and if sent without solutions, he would use his best endeavours to return such as might be satisfactory. Any new solutions of propositions already in print, especially of those included in the present collection, would also be very agreeable. If a variety of such demonstrations, essentially different from those of the original authors should be communicated, he proposes at some future time to publish them all, with a fresh collection for further exercise; and then each author's name shall be affixed to his own solution, or any other signature which he shall please to direct. Any person who shall favour the publisher with his correspondence shall have speedily conveyed to him the solutions of any propositions contained in this collection, which he may be desirous of seeing.

"Letters (post-paid) directed for P. Q. to be left at Mr. Nourse's, Bookseller, in the Strand, London, will be carefully transmitted on the first day of each month, and all correspondents may expect answers during the course of that month."

The manuscript collection previously noticed was one of the results of this mutual interchange of solutions, but it probably did not contain any investigation of the geometrical problem which had occupied the attention of Mr. Wales, since the question itself does not occur in Mr. Lawson's collection. In the previous number of this series of papers, it was observed that a solution of the general problem was still a desideratum, and the attention of geometers was directed towards a complete investigation. To this request no public answer has as yet been returned, although some months have elapsed since its appearance. I have, however, great pleasure in offering the following to the notice of the mathematical readers of this journal, which, so far as I am able to judge, leaves little to be desired either in elegance or brevity. It is from the pen of Mr. William Shepherd, of Bradford, one of the ablest of the Yorkshire school of geometers, who must be well-known as a constant contributor to the *Leeds Correspondent*, and other mathematical periodicals.

"Bradford, June 19, 1854.

"Dear Sir,—I have sent you this solution in consequence of reading a very pleasing article of yours in the *Mechanics' Magazine* for last month, and you are at liberty to make what use of it you may think proper. I have another solution on a different principle, but I think this preferable. It appears to me that the principles employed in the solution are applicable *to any curves having a centre, similar to each other, and also similarly situated with respect to their axes.* This needs no proof to those acquainted with the subject.

"Yours truly,

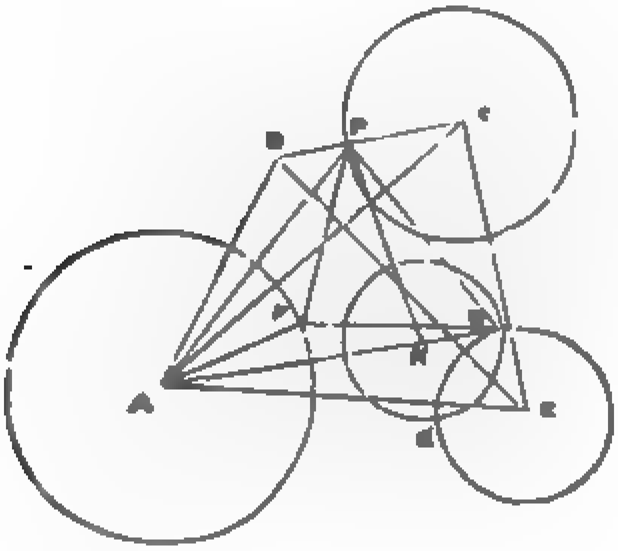
"WILLIAM SHEPHERD."

"Mr. T. T. Wilkinson, Burnley."

*Problem.*

Place a triangle, similar to a given triangle, so that its angular points may lie

upon three circles anyhow given in magnitude and position.



"*Construction.*—Let A, E, C, be the centres of the given circles whose radii are AF, BG, CP. On AE describe the triangle AED similar to the required one, and join DC intersecting the circle in P; join PA and draw PK such that ∠APK = ∠ADE; and take PA : PK :: DE : DA :: AF : KG. With centre K and radius KG describe a circle to intersect the circle to centre B in G and G′; draw PG, and from P draw PF making the ∠APF = ∠GPK. Join GF and PGF is the triangle required.

"*Demonstration.*—By construction PA : PK :: AF : KG, and ∠APF = ∠KPG; also ∠FPG = ∠APK = ∠ADE. Hence by *Euclid* 7.6, the triangles APF and KPG are similar, having AF : KG :: PF : PG :: DE : DA :: PA : PK. Whence the triangle PFG is similar to ADE, and its angles are posited upon the circumferences of the given circles (A), (E), (C)."—Q. E. D.

Mr. Lawson and Mr. Crakelt were both frequent contributors to the mathematical department of the *London Magazine*. This department was commenced in October, 1774, and was introduced by the subjoined notice to the editor:

"Sir,—A society of gentlemen desire room in your Magazine for a monthly mathematical correspondence, and intend that there shall be two months between the publishing of the questions and the answers, in order to accommodate those who live in the country with sufficient time to consider them. They invite the correspondence of the ingenious, whose favours shall be particularly attended to, by directing them *post-paid* to the Editor."

From internal evidence I have been led to conclude, that Mr. Joseph Keech, a clerk and attorney in the Lord Mayor's court office, was the editor here alluded to, and most of the correspondents in the earlier portions of the series were members of the London Mathematical Society. The first questions were proposed by Mr. Thomas Todd, Rusticus, and Le Gos, and amongst the other correspondents, as the work proceeded, we find "Mr. Robert Abbatt, jun., of Preston, Lancashire," a name I have not met with elsewhere, Messrs. Sanderson, Merritt, Bonnycastle, Lawson, Crakelt, Isaac Dalby, under the signature "Caput Mortuum," Ogle, Moss, Robins, "Analyticus, of Gisburne, Yorkshire," Hampshire, Wildbore, Ainsworth, Mabbott, "Salfordoniensis" (Dr. Henry Clarke), and others. Mr. Bonnycastle appears in 1776 as "Master of the Academy at Hackney," and in 1777 as "Teacher of the Mathematics, Leman-street, London." In the Magazine for January, 1776, the Rev. John Lawson reduces a geometrical problem to a case of the Determinate Section, and then adds, "The Synthesis is the construction of that case (*Book* I., *Prop.* V., *Epitag.* 2, *Case* 3, *of Wales's Restoration*) in Determinate Section. This was the method of the ancients; for when they had reduced any problem to a case of those tracts, which were called the SECOND ELEMENTS, they accounted it fully solved." I may here add, that Mr. Henry Buckley, of Wood House, Delph, has recently brought under my notice two comprehensive and elegant restorations of Determinate Section and the Section of Space, by M. G. Grabow, Frankfort-on-Maine, 1828 and 1834; two works on the Ancient Analysis hitherto unknown to the majority of English geometers. In both volumes the subjects are treated *algebraically*, but all the cases and sub-cases are very fully stated, constructed, and discussed.

The names of "Mr. John Buckley, of Milnrow, near Rochdale," and "Mr. Ralph Taylor, of Hollinwood, near Oldham," occur in the Magazine for October and November, 1776; both these gentlemen's solutions display a high degree of geometrical skill, and the latter had the honour of being the tutor of Wolfenden, the noted Lancashire mathematician. In the Magazine for May, 1777, it is stated (page 263) that "Mr. Lawson proposes shortly to publish a considerable variety of Demonstrations of the Theorems and Problems annexed to his Dissertation on the Geometrical Analysis of the Ancients;" the unexpected death of the compiler in November, 1779, prevented the publication of this collection, and the lost MS. is the one previously alluded to. The solutions by Mr. Jeremiah Ainsworth are very numerous, and are far superior even to those contained in "Burrow's Diary." His geometrical powers are here shown to great advantage. "Mr. John Fletcher, pupil to Mr. Taylor, of Hollinwood," is found in the Magazine

for February, 1778, as also is "Mr. John Fildes," the well-known contributor to the Liverpool "Student," when Mr. Taylor was "Teacher of Mathematics at Stretford, near Manchester." Mr. Taylor appears to have been equally familiar with mixed mathematics and geometry, and the same remarks apply to "Mr. Jonathan Mabbott, of Oldham," whose solutions begin to occur in this Magazine for the same year. This mathematical correspondence was discontinued with the solutions of questions 150 and 144 by Dr. Henry Clarke, under the signature "Salfordoniensis;" a letter from Mr. Bicknell is said to be sent [returned] to our "mathematical correspondent," and a final rejection of such matter takes place when a question on annuities is pronounced to be "unsuited to a miscellany intended for *general* information and *not for difficult perplexing calculations.*" This course must have resulted from a change of editorial management, and was probably consequent upon the diminished sale of the work; for in 1783 the "London Magazine" was "enlarged and improved;" the mathematical department was resumed, and one on natural philosophy added. I apprehend Mr. Nathan Parnell, of Nuneaton, was appointed editor of these departments, but his rule was only of short duration, for in June, 1785, the magazine was discontinued. The new series contains some good mathematical papers by Messrs. Keech, Clarke, Analyticus, Dr. Wolf, Todd, and Landen. The latter gentleman offers some "Animadversions on the third part of the Rev. Samuel Vince's paper on Series in the *Phil. Transactions* for 1782," and first notices the fact, that in what are termed *neutral series* regard must be had to the *remainders.* The last number of the magazine, however, contains a vindication of Mr. Vince's results, by "A. M." Altogether there are ninety-two questions answered in this series; many of the geometrical ones are of great value, and so also are those on Astronomy and the Projection of the Sphere. The abilities of Dalby and Sanderson are here very forcibly displayed, and the solutions of Mr. William Kaye, of Wakefield, prove him to have been an excellent geometer.

(*To be continued.*)

## ON MELTING POINTS.

BY B. C. BRODIE, ESQ., F.R.S.*

When the temperature of certain substances is raised, they pass from the solid to the fluid and from the fluid to the gaseous condition. These transitions are attended with the absorption of heat. There are other bodies which, by elevation of temperature, undergo a transformation of a different kind. Thus, when liquid phosphorus is heated, in such a manner that its change into the gaseous condition is prevented, at a certain temperature it becomes solid, and passes into the red modification; these allotropic changes also are invariably attended with evolution or absorption of heat.

Considerable anomalies are found in the statements which different experimenters have made as to the melting point of sulphur. The cause of these discrepancies lies in the facility with which the allotropic condition of sulphur is altered by heat. The melting point of octohedral sulphur lies very close upon the point at which it undergoes a change into the oblique-prismatic condition. When this sulphur has been melted, it passes more or less completely into a third allotropic form. For these reasons, the melting point taken was never that of a *pure* sulphur. However, by certain precautions in experimenting, the true melting points of sulphur have been ascertained.

The experiment cannot be made in the usual manner of taking a melting point, namely, by placing a thermometer in the fluid substance, and observing the point of solidification. Fluid sulphur is always a mixture of more than one modification. The experiment is made by placing minute fragments of sulphur in thin glass tubes, immersing the tubes in a bath of dilute sulphuric acid, and observing the temperature of the fluid at the melting of the substance. Experiments thus conducted have shown that the melting point of octohedral sulphur is 114·5° C., and of the oblique sulphur 120° C. This latter sulphur is obtained in a pure condition by heating the octohedral sulphur at a temperature below its melting point, from 100° to 110° C. This change invariably takes place when the sulphur is exposed, even momentarily, to this temperature in a state of powder.

The solidifying point of melted sulphur varies according to the temperature to which it has been raised in the melted condition. Powdered sulphur, carefully melted so as not to raise its temperature above 1° beyond its melting point, will solidify precisely at its melting point, 120° C. If, however, the temperature be raised to 300° C., it will solidify at about 110° C. The cause of this difference is, that the sulphur in the latter case always contains a large portion of a third modification; namely, the viscid form of sulphur.

There are some remarkable anomalies in melting points which do not so readily as the above admit of explanation. Under certain circumstances, drops of sulphur will

* The substance of a paper recently read at the Royal Institution.

remain in the liquid condition at a temperature far below the true point of solidification, and solidify instantaneously when touched. The same is the case with phosphorus. Water contained in a capillary tube may be immersed without freezing in a mixture cooled to 110° C. The same experiment may be made with a considerable quantity of water, if the surface be protected by a thin layer of æther. In these cases the water instantly freezes by agitation, or by touching the surface with a solid body. Similar observations have been made in the crystallization of certain salts. A solution of sulphate of soda, made at 30° or 40° C., will not crystallize on cooling, provided the fluid be not disturbed; but instantly crystallizes on touching the surface with a wire. This phenomenon does not take place with all solutions. A solution of nitre crystallizes normally. There is also a difference of degree in this property. A solution of borax will remain in an open flask in the supersaturated condition, and crystallizes only on violent agitation.

An experiment was shown, by which a connection was established between this class of facts and those of which mention was first made. Two tubes were exhibited, each containing the same quantity of sulphur dissolved in the same quantity of bisulphide of carbon. One tube had crystallized in the normal manner, the other had deposited no crystals. The sulphur had in both tubes been dissolved at the same time and in the same manner. But the tube in which the sulphur did not crystallize had been exposed to a higher temperature than the other tube. In this case, therefore, it was evident that the cause of the supersaturated condition was an alteration of the substance induced by heat. On breaking the point of the tube and agitating the fluid with a wire, the sulphur instantly crystallized. The analogy was pointed out, of the sudden alteration of this condition by agitation and contact, and the decomposition which many chemical substances, such as the iodide of nitrogen, undergo by similar causes.

## THE MONSTER IRON STEAM SHIP.

The following report of the progress of this extraordinary vessel, which persons passing down the Thames now see rising into form on the banks of the river, has been furnished to the Eastern Steam Navigation Company by Mr. Brunel, engineer:

"The arrangement and execution of the extensive preparations of works and plant necessary for the carrying out an undertaking of such unusual magnitude have necessarily occupied a considerable portion of time. These preliminary proceedings have been effected, and the works themselves have been pushed on with vigour. In regard to the ship, the first thing to be done was to construct upon the site which had been selected a large building slip capable of supporting the weight of such a ship, and to prepare it in such a manner as should afford the means of lowering the vessel into the water when completed, according to the plans previously arranged. To form the building slip, the whole foundations had to be piled with timber piles, many of them driven to the depth of 40 feet; and it may give an idea of the extent of such foundations to state, that nearly 1,200 loads of timber were consumed in these works, which have been completed in a satisfactory manner. While this work was in progress the working plans of the ship were made, and all the details of construction matured. Working models of the details of construction are also constructed on a large scale as the different portions are successively taken in hand. About 500 feet of the keel plates of the ship have been laid down, and the kelson or inner keel framed upon it. On this are now erected the transverse and longitudinal bulkheads of the middle part of the ship, 120 feet of which is carried up nearly to the full height and breadth. The several plates and materials of 240 feet of the middle body of the ship having been accurately set out, and the requisite orders given some time ago, are in course of delivery and being put together. For the more expeditious progress of the work, it has been arranged to roof over this part before winter, so that it may proceed without interruption from the weather, which would otherwise frequently prevent out-of-door work. Of the new machinery requisite to carry out this work, and in addition to the plant formerly on the premises, there have been erected additional steam-engines, punching machinery, and rolls, a new plate furnace, and several others are now in progress of construction. A splendid erecting-shop has been constructed, in which these engines, which require a clear height of upward of 40 feet, can be put together, and many other extensive provisions have been required and made in the foundry and elsewhere, to meet the peculiar demands of the case, so that I have every reason to hope that all due energy has been and will hereafter be used in pushing forward the work to completion. The engines for propelling the ship (those intended for working the paddle-wheels) are in course of construction also, by Messrs. J. Scott, Russell, and Co. These engines comprise four oscillating steam cylinders,

the largest yet constructed; they are 16 feet in length, intended for a 14-feet stroke, and 74 inches in diameter. These cylinders are cast in a single piece, requiring about 34 tons of metal to be melted and run at once. When finished they will weigh 28 tons; two of the four have already been cast with perfect success, and do very great credit to the establishment, and particularly to the master founder. Many of the minor parts of the machinery are in a corresponding state of forwardness. The screw engines, consisting of four 84-inch cylinders, are being constructed at Soho, by Messrs. Watt and Co.: though not so far advanced as the paddle-engines, all the details of the cylinders and frames have been determined upon, after much careful consideration. These parts are in course of construction, and I expect the cylinders will shortly be cast. There is no reason why, with due exertion, these, as well as the other engines and the ship, should not be completed at the periods fixed in the contracts. Before proceeding with the construction of the boilers, I have considered it prudent to make an experimental boiler, being a full-sized counterpart of one section or furnace of the proposed boilers; and in this I have tried various descriptions of anthracite and other steam coal; and I am happy to say that we find, with slight modification of the position of the fire-bars, we can burn, with highly satisfactory results, either anthracite or common steam coal under the same boiler, a very important advantage, as securing to us the means of freely selecting the fuel which may prove cheapest and best."

## ON ELEMENTARY INSTRUCTION IN MATHEMATICS.

BY THE REV. PROFESSOR BADEN POWELL, V.P.R.S.*

A FEW years ago the idea of mathematics being taught in elementary schools was not admitted, and even now there are those who doubt its propriety. If, however, we examine the question, we shall find that mathematics, in some form or other, necessarily enters into every course of general instruction. It is true that the higher branches of abstract or pure mathematics may not be common or necessary in elementary schools; arithmetic, at least, which is one portion, has always formed part of the work of every school. Our knowledge of forms, contents, areas, &c., is, as far as it goes, mathematics; land surveying and measuring, again, are mathematics. The curves formed by the intersection of planes and solids one with another are shown practically by means of models, and the eye learns practically to appreciate them. But to reason on them, and deduce from certain known data the actual properties of such curves, forms another and higher step in the study of mathematics. The object of this lecture was to point out how elementary mathematics may be taught practically with less difficulty than at present is usually thought unavoidable in this country. It has been said there is no royal road to mathematics, but this must be taken with some degree of allowance, and it may be shown that there are means of studying this science with greater facility than by adhering to the old systems at present in use. In this country the custom is to make Euclid the text-book for teaching geometry. On the Continent this is not so. No difficulty is arrived at till we come to the theory of parallels, and here the learner is compelled to assume a something which is certainly not self-evident. This is the first difficulty. This may be got rid of entirely by teaching the pupil at once the doctrine of a *limit*. This is not usually done till the more abstruse and higher branches of mathematics are entered upon; but, as it must be learned one time or another, why not teach it at once in the early stages? Give the pupil a distinct idea of a *limit*, and all the difficulties attending the theory of parallels are at once easily resolved. The pupil then passes on till he comes to the fifth book, which, beautiful as it is, is perhaps as difficult a book to be really understood as can anywhere be found; and it may be questioned if one person in a thousand who reads it has any just appreciation of its merits, or can make out why Euclid adopted what seems a long and roundabout way of proving the doctrine and properties of proportionals. The pupil, who, by the time that he arrives at this book, has usually learnt some algebra, is told by his teacher to cut the fifth book, as too difficult, and that the theory of proportionals may be much more readily proved by algebra. The ancients had a contempt for mere arithmetic, and considered it beneath the dignity of mathematics to be dependent in any way upon the idea of number. Euclid, therefore, rigidly excluded it, and devised what must be deemed a masterpiece of human ingenuity, the discussion of the whole theory of proportionals without introducing the idea of number into it. Algebra, on the

* This paper contains the substance of one of the very valuable course of lectures at present in progress in connection with the Educational Exhibition that is now open at St. Martin's Hall, Long-acre, under the patronage of the Royal Society of Arts. We attended Professor Creasy's on Saturday afternoon, to our great gratification. We seriously commend the remainder of the course to the attention of our town subscribers.

contrary, deals with number. Once introduce this element, and the theory of proportionals becomes as simple as possible. It is true, no doubt, that there are proportionals to which the idea of number is not applicable—such, for instance, as the ratio of the side of a square to the diagonal, &c.; but for all practical purposes, though not with perfect exactness, it is true, numbers may be found which represent their proportions sufficiently near. By dividing each line into a smaller and smaller unit, we shall, by introducing the idea of an infinite number of such units, arrive at a unit in which both lines may be readily expressed in magnitude numerically. This is the doctrine of infinitesimals, which necessarily enters into the higher branches of mathematics, and therefore why should it not be taught at once, as by this means a very great difficulty is removed out of the way of the learner? We may, therefore, use the algebraical solution of geometrical problems. From the algebraical method of proportions we get this proposition, which is nowhere proved in the fifth book of Euclid, viz., that the product of the extremes is equal to the product of the means. The idea of multiplication is thus introduced. Now the second book of Euclid may be readily proved algebraically. The product of two numbers or magnitudes expressed numerically is identical with the rectangle. Teach the pupil this, and the second book of Euclid is shortened at once into one simple lesson.

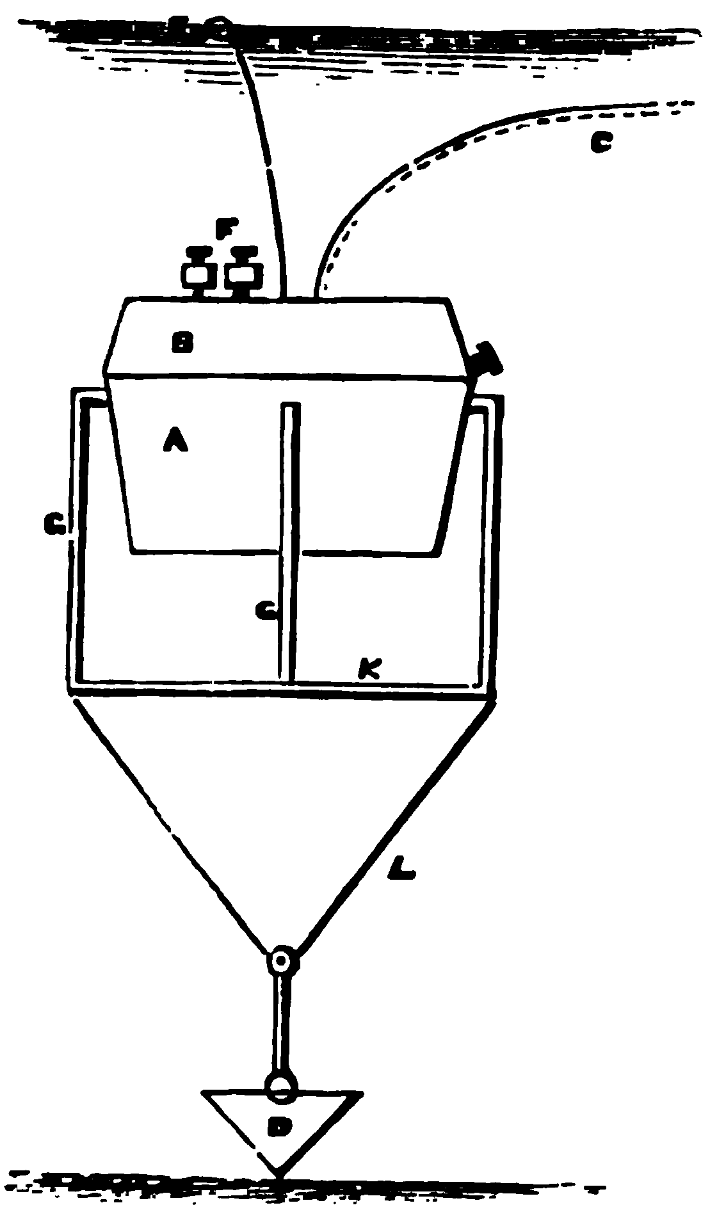
Mathematics, it is said, should be taught as a training for the mind—as, in fact, a practical logic; the benefit in this respect the lecturer considered as greatly overrated, but he held that mathematics should be taught as a key to all physical investigation. Teach the pupil at an early stage the nature of a limit and the doctrine of infinitesimals, and by these means you remove very considerable difficulties out of his path. It is true that we may sacrifice something of pure geometrical reasoning, but why retain this when the reasons which actuated the ancients no longer compel us to do so? And as to the mass of students, the great object of mathematical studies must be their application to physical science, surely the easiest and most direct path is the best, and the amount of mathematical study requisite for this purpose will thus be reduced into every narrow compass.

## RUSSIAN INFERNAL MACHINES IN THE BALTIC.

Whether the Czar of Russia is at this moment guarding the fortresses of Cronstadt, and his own capital, from the assaults of the allied fleets by means of the infernal engines of M. Jacobi, we do not pretend to say; but we certainly are of opinion, that much of the three millions recently voted by Parliament for the prosecution of the war will probably be expended on less laudable operations than some of our talented electricians might apply it to, were they commissioned by the War Minister to try a few extensive experiments on those stone walls which even Sir Charles Napier has pronounced secure from destruction by shot and shell. If Russia has a Jacobi to defend her strongholds, we have among us one of more illustrious name, and might send a Faraday to lead an attack upon them. And Sir Charles would less endanger his fame by grouping his fleets protectively about our great scientist, than by cruising ingloriously in the seas of an enemy. With powers of ascending in the air, and of descending in the sea,—of filling the air with deadly vapours,—of exploding combustibles distant from us by miles, by the contact of two ends of a wire,—with powers, indeed, which, could they have been suddenly disclosed to our ancestors a century or two since, would have appeared to them to fall but little short of the attributes of Omnipotence, why should not a great and daring innovation be made upon our old methods of warfare; an innovation which, failing, would entail none but a pecuniary evil, and which, succeeding, would startle the despot with whom we battle into a wiser and more humane policy than that of arraying his subjects against the most exalted nations of the earth. To suggest detailed methods by which the recent developments of electrical and other science might be employed in assaulting the Russian coasts comes scarcely within the range of our duty; at the same time it would be well if our scientific readers and friends were to apply themselves with vigour to the subject. Already more than one improved system of naval warfare has appeared in our own pages, but systems of attack on fixed fortresses by the means we have indicated have not been, we believe, very extensively studied.

It is not our intention to add at present to what we have just suggested; we shall probably recur to the subject. Meanwhile the following description of Jacobi's machine, which was copied into the *Illustrated London News* of Saturday last, from the *Folkets Röst* (Swedish Journal) of July 8, may be of interest to our readers. "A and B consist of two close-fitting copper receptacles, which form together a large hollow vessel or mine. At F are two pipes, through which the charge is introduced, and they are then hermetically sealed. C is a leather

pipe, wherein is secured a copper wire, covered with gutta percha, which has one end in communication with the charge in the mine, and the other with the electrical apparatus on shore. At G are four iron bars, firmly bolted to the mine, and secured below to an iron ring (K), from which a rope droops, and goes round a pulley (L), attached to an iron weight (D), in the form of a pyramid upside down, whose apex touches the ground. Lastly, E is a small white wooden ball, which is secured to the mine, and floats on the surface of the water. By means of this, those on land can see when the enemy's ship is over a mine, and directly proceed to work."




The Swedish engineer, who during the winter worked in the factory where these mines were made, adds, that "though an experiment with one of them on an old merchant-vessel was fully successful in smashing the vessel, the firing off the mine is in the highest degree unsafe; and the ships menaced can easily cut off all communication between the shore and the mines; as the situation of the latter can be easily discovered by means of the floating ball."

It certainly appears to us highly improbable that, if such instruments as these were really submerged in the Cronstadt channels, their position should be indicated by floats. It is far more likely that their bearings and distances are taken by surveying contrivances on shore, as we have seen intimated elsewhere, than that floating marks should be employed for the purpose.

## ON THE PRESERVATION OF TIMBER.

ABSTRACTED FROM A LECTURE BY G. R. BURNELL, C.E.

When wood is exposed to frequent currents of air, especially at high temperatures, the moisture it contains evaporates too rapidly, and gives rise to cracks and fissures which either destroy the resistance of the material, or open a passage for the water contained at other times in the atmosphere to penetrate to the interior of the mass. If the temperature to which wood is exposed, whilst any sap remains in it, is too elevated, the vegetable fluids ferment, the tenacity is diminished, and when the action is carried to its full extent, the wood quickly becomes affected by the dry rot. Exposure to the atmosphere in positions where rain can lodge in quantity, contact with the ground, and application in damp situations deprived of air, will render wood liable to the wet rot; and however well seasoned it may have been previously to being brought within the influence of any of these causes, it will infallibly suffer. It is therefore of the highest importance, that whether in the merchants' stores, or subsequently when placed in a building, wood should be preserved from contact with the ground, and that air should have free access to it in every direction. The germs of destruction are often communicated whilst the wood is in store from neglect of these simple precautions; if they be once implanted, the progress of decay can never be subsequently arrested. It has been supposed that keeping wood in water tends to prevent the commencement of dry rot, because in that position the sap is washed out of the pores. If this theory is correct, it must be evident that the oftener the water is changed, the greater will be the probability of its producing the desired effect, because if it be allowed to stagnate it must become saturated with the sap in course of time, and unable to take up any additional quantity which may be present. Duhamel observed, that if wood were immersed immediately after it was felled, it would be less liable to decay than if put in water at a subsequent period; he also found that immersion tended to preserve the wood from the attacks of insects, and even to arrest the progress of some kinds of decay, but that a notable portion of the strength was lost. The drying and seasoning take place with greater rapidity after

immersion, probably because the water displaces the sap, which does not evaporate so rapidly as the thinner fluid. Duhamel asserts that the process of charring the ends of posts, &c., built into the ground, is very inefficient, and that it is only of use to the extent of interposing an extraneous substance between the wood and the earth; in his opinion it would be better to enclose the lower ends in sand, stone, cinders, or other materials which would easily carry off the water supplied by the surrounding media.

When wood is converted and placed in a building, its durability may be greatly increased by covering it with a coating of paint, or other substance which will prevent the moisture of the atmosphere from obtaining access to it. But it is essential that the wood so covered should be free from sap or internal moisture, or the very perfection of the coating will be found to accelerate its decay. Care must be taken to prevent water from finding its way into the joints, and if the wood be exposed directly to the action of the sun, it should be painted of a colour able to reflect rather than to absorb heat. It is desirable that it should be planed before being painted, in order that the paint may be applied in an equal manner over the surface. It is important also to observe, that the moisture in the atmosphere not only affects the volume of the wood, but frequently alters the position of the fibres by producing a torsion analogous to that which may be observed in hygrometric cords.

Of late years the processes of kyanizing, creosoting, and immersing timber in solutions of mineral salts, have been applied with various success for preserving it from rot, and the attacks of worms or ants. Of these, kyanizing, which employs a solution of deutochloride of mercury, appears to be most satisfactory; and among some striking illustrations of its results, may be cited the fence of the Regent's-park; the posts of which were inserted in the ground, without being painted, at least eighteen years since, and remain at the present day in very tolerable condition. For railways and harbour works, English engineers appear to prefer the system of creosoting, or immersing the timber in the rough oil of tar, until it has absorbed at least 7 or 8 lb. per cubic foot. The difficulty of injecting so large a quantity of oil is overcome by exhausting the sap and moisture from the wood in vacuo, and then forcing in the oil under great pressure; a species of artificial drying is, however, frequently necessary, and indeed the success of this process appears to depend entirely upon the extent to which the original moisture is withdrawn. Both corrosive sublimate, and oil of tar, are capable of resisting the causes of decay communicated by the atmosphere, and the latter is said to be an effectual preservative against the attacks of boring animals; but it is to be feared that the ordinary manner of applying them does not ensure their penetration to a sufficient depth to attain the objects desired. The use of the sulphate of copper, and of the other metallic salts has hitherto been unsuccessful.

In the bent timber bridges which have been constructed on some of the recent lines of railway, although every ordinary precaution was taken in selecting the timber, immersing it in solutions of the metallic salts, and in painting it when in place, the wet rot has exhibited itself in so many instances as to render it almost necessary to abandon a system which appeared to have many recommendations. It is, however, to be observed that these bridges decayed solely because their elasticity caused them to yield upon the passage of every train. The play thus produced caused the joints to open; and moisture, furnished by rain or the condensation of vapour, found its way into the interior of the beams. The failure of the bent timber ribs in such situations does not, therefore, in any manner affect the propriety of using that construction on more suitable occasions. A valuable lesson is, however, to be learnt from the above fact, viz., that it is difficult, if not impossible, to protect complicated systems of carpentry from the effects of the atmosphere, when exposed to the occasional action of heavy loads able to produce a disturbance of their main parts.

In the theatre at Munich a soluble glass was applied to the woodwork and scenery for the purpose of preserving, and, as far as possible, rendering them incombustible. The glass was, in fact, a solution of free silica in caustic alkali; and if the wood was properly seasoned, there can be no doubt of the value of the application, especially if it was injected under pressure. Professor Way's researches into the silica beds of the lower chalk prove that a solution of this nature could be obtained easily and economically; and the advantages it offers certainly render its application desirable.

## THE LATE BOILER EXPLOSION AT ROCHDALE.

The following is the verdict of the jury who have lately been sitting to inquire into the causes of this catastrophe:—"That, in the opinion of the jury, the death of Ann Stott, and nine other persons, was caused by an explosion of the boiler at the Bridge-

field-mill, occupied by George Williamson, such explosion being caused by an excessive pressure of steam, and that pressure being produced by the following circumstances:—First, the 3-inch safety valve not being in working order, and consequently inactive; second, the 2-inch safety-valve being, on the morning of the explosion, much overweighted; and third, as the engine only worked at intervals from six o'clock to twenty minutes past, a space of time elapsed during which the fire was kept up, and in that time such an amount of heat was added to the water in the boiler, and pressure therein accumulated, as to render it impossible that the boiler could be relieved by the small or 2-inch valve when so overweighted. The jury, at the same time, wish to express their opinion that the boiler and engine at Bridgefield mill were very improperly managed, thereby causing danger to the parties employed, and that the occupier and engineer are exceedingly blameable for working the boiler at the high pressure they have done for a long time previous to the explosion."

## INSTANTANEOUS INDICATOR FOR MAPS.

A very simple but useful appendage to maps has recently been invented, and is now being patented in this country, by M. Acklin, of France, the inventor of the "*monoclave*" or "*semitouche*," an apparatus by the aid of which any simple piece of music may be executed at sight on the piano, organ, accordion, or any other musical instrument that has a key-board.

His improvements in maps are intended to facilitate the finding of obscure places, in searching for which time is frequently wasted. He places a coloured border along the upper, lower, and right-hand edges of a map, and on this border prints a series of numbers ascending in their proper order—1, 2, 3, &c.; and at about the middle of the left-hand edge of the map he fixes on a centre one end of a coloured tape, upon which also a series of numbers is printed. Upon one part of the map, or upon a paper connected with it, he arranges alphabetically the names of all the places marked upon it, and opposite to each name prints two numbers, such that when the other end of the tape is brought to the number in the margin of the map corresponding to one of these two, and the number on the tape corresponding to the other of the two is found, the place itself is seen below the latter.

Supposing we had before us a map of London, furnished as above described, and we wished to find out a particular street—say Wellington-street—we should proceed as follows:—We should first consult the alphabetical list, and observe the numbers placed opposite to Wellington-stree t; let us assume them to be 36 and 15: taking the end of the tape in our right hand, we should extend it over the number 36 in the margin, and then look to the number 15 upon the tape, and beneath this Wellington-street would be seen. Nothing can be more simple than this arrangement, which will doubtless soon become of very general service.

## A PHYSICAL PROBLEM.

*To the Editor of the Mechanics' Magazine.*

Sir,—The following physical problem is, I believe, of general interest; and if you will be kind enough to admit it to your pages, I have no doubt that some one of your mathematical correspondents will have the goodness to furnish a solution of it, which will be peculiarly acceptable, at least to

Yours, &c.,

Inquirer.

Blackheath, Aug. 1, 1854.

Problem.—How may the height of a mountain be determined from the observed difference between the times of oscillation of a pendulum placed first at its base, and afterwards upon its summit?

## IMPROVED CANDLESTICKS.

*To the Editor of the Mechanics' Magazine.*

Sir,—Your Southampton correspondent, I suppose, is not aware that candlesticks with springs fixed in the sockets for the purpose of clutching the candle, and keeping it in an upright position, have been in use for many years, and known as "Barlow's patent." The only objection to them, I believe, is the accidental breaking of a spring, and a little more trouble to the servant in cleansing the socket from the melted tallow.

I am, Sir, yours, &c.,

A 30 Years' Subscriber.

Eton College, Aug. 1.

P.S.—I think a description of the candlestick was given in an early number of *Mech. Mag.*—have not had an opportunity to refer.

## GALLOWAY'S PATENT IMPROVEMENTS IN TUBULAR BOILERS.

(Patent dated January 18, 1854.)

Mr. Robert Galloway, engineer, of Lambeth, has patented a very simple but excellent improvement in the method of constructing tubular steam boilers, the object being to supply atmospheric air to the gases as they rise into the fire-box. The invention consists in inserting air-pipes into some of the lower tubes of the boilers, in the manner shown in the accompanying engravings.

Fig. 1 represents a marine furnace and boiler with the improvement applied to it.

Fig. 1.

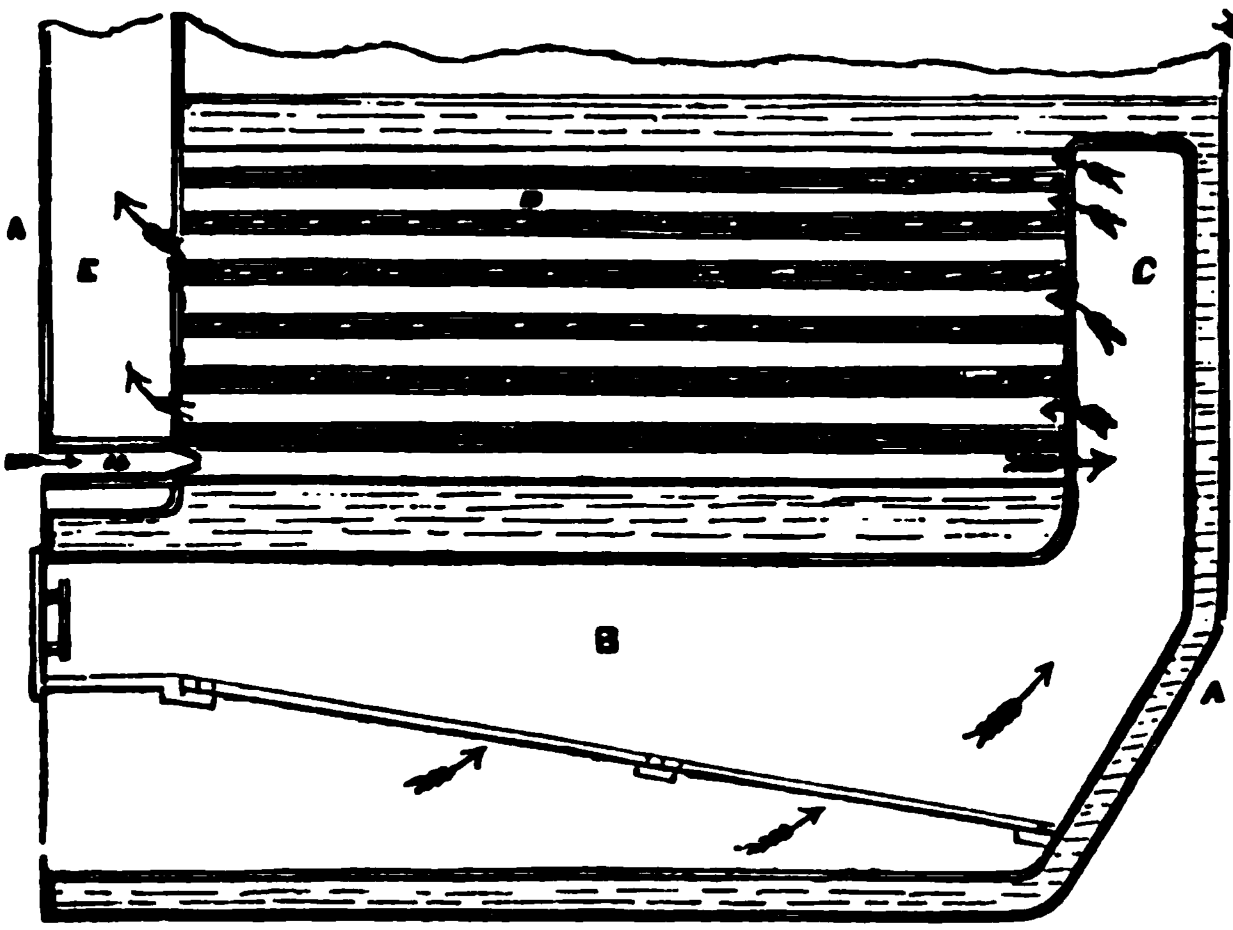
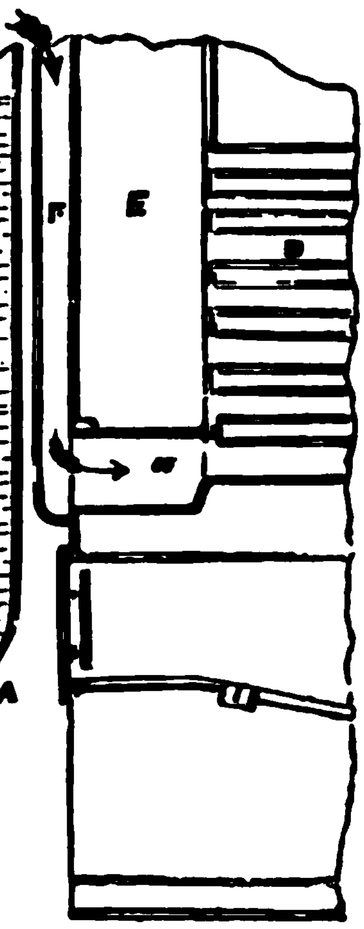



Fig. 2.




A is the shell or case of the boiler; B, the furnace; C, the fire-box; D D, the boiler-tubes; E, the smoke-box; and *a* is a short pipe or tube passing through the smoke-box door, and into one of the lowest range of boiler tubes. This pipe or tube being open to the atmosphere, it is evident that a current of air will pass through it, and passing on through the main tube will mingle with the gases in the fire-box and promote combustion in the usual way. As the drawing represents a vertical section, it is not possible to show more than one of the short tubes fitted as described; but the inventor proposes to introduce as many of them as may be deemed necessary, either in the lowest or a higher range of tubes.

Fig. 2 represents the front portion of a boiler and furnace, fitted with a modification of the preceding arrangement. In this case a double smoke-box door is fitted, and an air-chamber, B, encloses the whole of the ends of the lower set of boiler-tubes, the air entering above the door of the smoke-box. One great and very important advantage of this modified method of construction is that the air, by entering above and passing down to the chamber, B, will produce the double effect of becoming heated in its passage, and of keeping the engine room cool.

In order to increase, when necessary, the impetus acquired by the air in passing to the fire-box, Mr. Galloway sometimes fits in the inner or fire-box ends of the tubes through which it passes, a cast-iron cap, which partially closes the orifice. A section of this cap is shown separately in

Fig. 3.

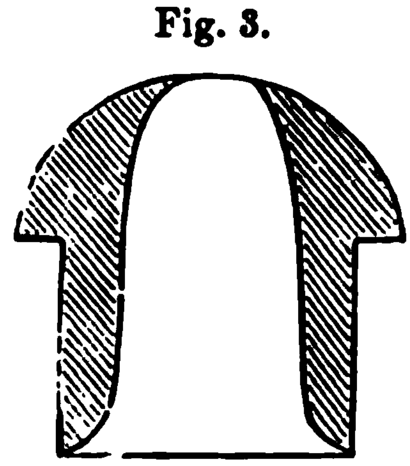


fig. 3; and for the purpose of charging the air, before it is admitted to the fire-box, with a greater amount of heat than it would acquire in either of the preceding arrangements, he in some cases makes the air-tubes of a less diameter than those of the boiler, and permits those of the latter, through which the former pass, to retain their original character of fire-tubes.

*The Practical Surveyor's Guide, containing the necessary Information to make any Person of common capacity a Finished Land Surveyor, without the aid of a Teacher.* By ANDREW DUNCAN. London: Sampson Low, Son, and Co., American Booksellers, Ludgate-hill.

SUCH of our readers as have already purchased this work we strongly advise to peruse only the author's preface. By reading that they will become pleasantly impressed with the belief, that they are the possessors of a work, concise in its treatment, instructive in its details, and teeming with original improvements in the practice of surveying. But by proceeding further they will assuredly come, first, to marvel where these qualities are to be found, then to suspect that their anticipations were illusory, and finally to conclude, however reluctantly, that the capital expended upon the treatise was improvidently invested.

When we find a gentleman putting himself to the trouble of sending such a book as this from the other side of the Atlantic, for the purpose of making young Englishmen, "of common capacity, finished land surveyors," we are at once urged to the conclusion, that his opinions, respecting either his production or the individuals referred to, are decidedly erroneous. Certainly we have not the pleasure of knowing any young countryman of ours of whom it might be said, that, under the unabetted influence of Mr. Duncan's work, exerted during the average lifetime of the population of these regions, he would become what any respectable professional man would pronounce to be "finished" in land surveying.

It is an unfortunate circumstance for the author, that he sat down to prepare his preface before he had executed his work. Such a proceeding is in no case a prudent one, but it is exceedingly damaging to the early essays of a writer, (and we surmise that the works of Mr. Duncan are not yet very voluminous). Nothing is easier than for an individual, who has persuaded himself that the world stands in need of a work the production of which comes within the range of his genius, to discover grave but imaginary defects in the labours of his predecessors, and to attach a slightly unreal importance to such of his own works as, by the aid of a prescient fancy, he already looks upon as executed. Men often enough slide into extravagance while contemplating what they have really performed; how, then, can they expect to avoid misconception when they give themselves up to the admiration of that which they intend to do, as if it were already accomplished?

As we cannot write a very close criticism upon a work like this, we shall be pardoned for instituting a comparison or two, which the foregoing thoughts have suggested to us. We are perfectly well aware that we shall be suspected of acrimony when we place what is given in the body of the work by the side of what is stated in the preface. We foresee that we shall necessarily be charged with malevolence in consequence of this proceeding. But suspicions and imputations of an injurious character are the inevitable, and, to us, unfortunate results of having to review such a work as this. The fact is, while many critics bear too heavily upon authors, Mr. Duncan has completely victimised the critics. And the worst phase of the matter is, that he compels his reviewers to suffer in direct proportion to their honesty. For, we venture to say, that the fairest representation of what the book really is would appear to those who have not perused it as the most exaggerated and embittered criticism. We will not, however, shrink from the burden he has so skilfully laid upon us.

In his preface Mr. Duncan says, "Many of the works (on Surveying) already published contain subjects not necessary in such treatises, such as Geometry, Plane Trigonometry, &c., which subjects, it is taken for granted, all who intend to become proficients have studied prior to reading Surveying." We have already intimated that the preface was unhappily written before the treatise was compiled; it now strikes us that it must have been penned very long before,—so long, indeed, that even the memory of it had passed altogether away by the time that the work, then "looming in the distance," came to assume the form of a reality. For, although the entire book consists of only 107 pages (exclusive of tables), we find the first section of it, comprising 34 of the 107, occupied by problems of which that on the first page is, "To reduce two pole chains and links to four pole ones," and that on the last, "To find the area of a circle having the diameter given." And lest it should be supposed that much valuable matter intervenes between these remarkable boundaries, we will set down two or three of the intermediate ones at random. On page 10 we read, "A square is a plane figure, having four equal sides and four right angles. To find the content, multiply the side into itself, and the product is the content." On page 16, "Having the three sides" (of a triangle) "given to find the area rule, add the three sides together and take half the sum, from which subtract each side severally, multiply

the half sum and three remainders continually into each other, and the square root of the product will be the area."* To this the author adds what he denominates "a most satisfactory proof of the above rule," but what to us appears to contain nothing astonishing either in respect of clearness of deduction or elegance of style. On page 25 is brought forward the following problem, which our readers, some with the aid of a scrap of paper and a pencil, and some without these, will readily understand: "Let B A C be a triangular farm, and P" (a point in A C) "a well of water. It is required to draw a line or fence from the well that will divide the farm equally between the two partners. Find D, the middle of the base, B C, and from P take a course of P D. Again set your instrument at A, and take the same course, A E; cause a pole to be set at E, a line or fence from E to P will bisect the farm." But here the author checks us in our course of humble disagreement, and introduces a mode of inculcating mathematical principles which is deserving of all praise; for he adds, "This is easily demonstrated from the figure. See Bland." There is one other example which we should like to quote, if we had space; it is moulded into a pleasing metrical form, and has reference to an individual who started on a surveying expedition, "one morning in May," and who appears to have struck heartily into the exhilarating operation of measuring round a four-cornered ground,

"As soon as bright Sol he espied,"

and who subsequently appealed, in modest and somewhat touching terms, to certain youths for assistance in finding "the meadow's content." The effusion is not, however, claimed by the author as original, as he bounds it by inverted commas, and, indeed, in a foot-note, openly acknowledges it to be derived from the 147th page of the second volume of "Deighan's Arithmetic."

But really we almost begin to feel that there is something more in the work than we at first conceived, for it is certainly leading us into a rather lengthy notice of it. We must hasten on. The second part of the work is headed, "Trigonometrical Surveying." It commences thus: "It was not my intention to say anything concerning this branch of surveying, as it is too extensive a subject for this small work; but as some young readers may not have met with anything on that subject, I will present them with an outline of how that grand operation is conducted." Here, then, we enter upon a second section that is foreign to the author's original purpose; and, to our great amazement and perplexity, this irrelevant section is of a most unaccountable length,—in fact, it appears to end on the last page of the book,—so that where the matter that stood out with such beautiful and gratifying distinctness before the mind of the author, when the very promising preface flowed from his pen is to be sought for, we are at an utter and almost stupifying loss to determine! The subject is certainly involved in deep mystery; and, at any rate, there is no subsequent heading printed in any such striking type as that in which the abovementioned appears.

But passing by this difficulty, we must, out of justice to the inventive genius of Mr. Duncan, and by way of some small compensation for the apparent detraction from the author's scientific merits, that may have been conveyed in one or more of our previous remarks, introduce to the notice of our readers "*An instrument by which any person, though unskilled in surveying, may measure a map, or part of a map, almost at one view.*" We quote the author's own "description" of this valuable instrument: "Get a piece of good glass, about 8 or 9 inches long, and 6 or 7 inches broad, and divide it into small oblong rectangles of eight-tenths of an inch by 5 five-tenths, as fig. 19th." (Fig. 19 consists, as the more acute of our readers will have surmised, of a large rectangle divided into a number of small ones.) "By laying this instrument (which I call a *computor*) on a map, you can tell, with very few figures, sometimes with the eye only, how many of the rectangles are contained in the map; and, consequently, how many acres." The startling *originality* of this "instrument," and the profound acquaintance with physical and mathematical science essential to the *conception* and *perfection* of such a contrivance, may well excite our admiration, and outweigh the seeming defects of the author's literary disquisitions.

In taking our farewell of this little work, we do not pretend to say that we have overlooked nothing in it which is of intrinsic value,—perhaps we have;—we cannot tell, for there are many parts of it which we have not even read through. We make this acknowledgment freely, and think we could justify our omissions upon the ground that we have said enough to *indicate* both what the work professes to be, and what, upon the whole, it is. For ourselves, we must confess that we have read many scientific works with much less hilarity than has been experienced in our perusal of this, and we willingly and cheerfully concede to the author the full value of this acknowledgment. We will only add that, although the book has affected us, as has been mentioned, we think it might possibly exert a contrary influence upon learners.

* This (including punctuation) is copied accurately from the original.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

HIGHTON, EDWARD, of Regent's-park, Middlesex, civil engineer. *Improvements in suspending the wires of electric telegraphs.* Patent dated January 17, 1854. (No. 108.)

The inventor attaches cross-bars or arms to the sides of the posts, one above another, and so regulates their lengths that each arm is always either shorter or longer than the one above it; and by this means, combined with that of attaching wires by insulators to the ends or near to the ends of such arms, he avoids having one wire perpendicularly above any other.

HOLLAND, HENRY, of Birmingham, Warwick, umbrella and parasol manufacturer. *Certain improvements in the construction of parts of umbrellas and parasols.* Patent dated January 17, 1854. (No. 109.)

*Claims.*—1. Constructing umbrella and parasol runners each of one piece of metal. 2. A mode of making the top notch ends of steel-wire ribs of umbrellas and parasols by first enlarging those ends and then flattening and piercing them.

CORLETT, HENRY, of Summer-hill, Dublin, esquire. *Improvements in springs for railway and other carriages and vehicles.* Patent dated January 17, 1854. (No. 111.)

The inventor describes a combination of springs in the form of the letter C, with others of an elliptical form (or substitutes therefore); the former being so applied and connected as to be brought into action in a direction opposite to the latter, but simultaneously with them.

SLOPER, BEVAN GEORGE, of London, civil engineer. *Improvements in machines or apparatus for separating gold from earthy matters.* Patent dated January 17, 1854. (No. 113.)

The inventor breaks down the materials with which the gold is mixed, by means of half-cylinders and cutters, and employs a nugget-box for separating and projecting from the inner of the cylinders such pieces as are too large to remain; he then sifts the material into quantities of different degrees of fineness, by means of annular revolving sieves, and ultimately separates the gold from the earthy matters, by passing upward currents of water through them.

HAIGH, WILLIAM BLACKETT, of Oldham, Lancaster, machine-maker. *Improvements in machinery or apparatus for tenoning, mortising, slotting, cutting, or shaping wood or metal.* Patent dated January 18, 1854. (No. 114.)

The inventor constructs a framework of wood or metal, and in the top part of it makes a vertical slot in which the tool-carrier slides, having given to it an up and down as well as a cross motion, for the purpose of opening or contracting the space requisite for the introduction of the various sizes of material to be operated upon, which is placed on a rest, the tool being then pressed down by a treddle or other convenient means. The action of the tool is regulated by a rack and pinion, on the end of which is fixed a spring to make the tool react of itself.

LORD, EDWARD, of Todmorden, York, machine-maker. *Certain improvements in looms for weaving.* Patent dated January 18, 1854. (No. 115.)

*Claims.*—1. Unwinding the yarn from the warp-beam, by means of the rocking-frame or vibrator. 2. The application of a shield to a ratchet-wheel, as described. 3 and 4. Certain methods of unwinding the yarn from the warp-beam. 5. An improved combination of parts for regulating the quantity of yarn to be let off by the rocking-frame. 6. Regulating the amount of friction upon the warp-beam, according to the several lengths of yarn between the warp and cloth-beams.

THOMAS, WILLIAM, of Cheapside, London. *Improvements in stays.* Patent dated January 18, 1854. (No. 120.)

This invention, which relates to stays that fasten in the front, consists mainly in fitting in the backs of them lacing holes which are to be kept constantly threaded, the ends of the laces passing round the person. The stays are fastened by means of a series of openings formed in the busk to receive the heads of studs; such openings having slots for the stems of the studs, and being placed some in one and others in another direction.

SHARPE, EDMUND, of Swadlincote Potteries, near Burton-on-Trent. *Improvements in the apparatus used for sifting clay.* Patent dated January 18, 1854. (No. 121.)

The inventor employs sieves which he surrounds by frames, which give a to and fro motion to them as they lie in an inclined position, so that the clay and water may, by a proper sluice, be allowed to flow continually over the whole width of a sieve at its upper end, and descend down its inclined surface.

HOWARD, CHARLES, of Trafalgar-terrace, Hoxton, Middlesex. *Improvements in the manufacture of iron.* Patent dated January 18, 1854. (No. 122.)

This invention consists in the combination of the ores "in a disintegrated and cleansed state with the fuel, fluxes, alkalies, or alkaline solutions, when requisite, prior to submitting the same to the action of heat, however the same may be applied."

GALLOWAY, ROBERT, of Lambeth, Surrey, engineer. *An improvement in admitting air to furnaces where tubular boilers*

*are employed.* Patent dated January 18, 1854. (No. 123.)

A full description of this invention is given in a former part of this Number.

BURSILL, GEORGE HENRY, of Offord-road, Barnsbury-park, Islington, engineer and assayer of minerals. *Improvements in operating upon metalliferous ores and other minerals, and upon slags and sweep, in order to facilitate the separation and recovery of the metals and other products; also in machinery or apparatus for effecting such improvements, which is in part applicable to other purposes.* Patent dated January 19, 1854. (No. 126.)

In carrying out the primary feature of this invention the ores, slags, and sweep or tailings are to be reduced to an impalpable powder, "not with metallic mercury alone, or with metallic mercury and water only, as practised heretofore, but with a solution of mercury, or with a solution of some one or other of the salts of mercury that are readily soluble in water, and either with or without the addition of metallic mercury."

SPILLER, JOEL, of Battersea, Surrey, engineer. *Improvements in measuring and mixing, crushing, grinding, and pulverising, wheat and other substances.* Patent dated January 19, 1854. (No. 127.)

*Claims.*—1. A meter consisting of a regulator formed with projecting blades rotating in a cylinder. 2. A general arrangement and combination of parts for crushing grain, comprising a cylinder rotating between abutment pieces, pressed up by a regulated power, and capable of receding by excess of pressure; also a mode of connecting the spindle of the crusher with the runner. 3. "The combination of straight lines in one of a pair of mill stones, and curved lines in the other, so as to improve the draft." 4. "The employment of marble or glass for pulverizing middlings."

DALGETY, ALEXANDER, of Florence-road, Deptford, Kent, engineer. *A new construction of rotatory engines or pumps.* Patent dated January 19, 1854. (No. 128.)

This invention relates to an improved construction and arrangement of the cylinder covers and pistons of rotatory engines and pumps, "and consists in the employment of a circular-bored cylinder, having a piston-rod or shaft situated eccentrically in the cylinder, or without the axial centre line of the same."

NORTON, JOHN, of Cork, Ireland, esquire. *Improvements in effecting communications between the different parts of railway trains.* Patent dated January 19, 1854. (No. 129.)

The main feature of this invention consists in constructing certain signal arrows and missiles, correspondence concerning which has already appeared in our pages.

WEBB, THOMAS, of the Platts Glass-works, Stourbridge, glass-manufacturer. *Improved apparatus applicable to the annealing of glass and the firing of pottery ware.* Patent dated January 19, 1854. (No. 130.)

The inventor constructs the lear or kiln of a circular form, and employs an annular travelling table (or its equivalent) for submitting the articles to be operated upon to the heat of the annealing chamber, and ultimately bringing them opposite the discharging apertures.

PARKES, FRANCIS, of Sutton Coldfield, Warwick, edge-tool and agricultural implement maker. *A mode or method of fixing tools and implements in helves or handles.* Patent dated January 19, 1854. (No. 133.)

A full description of this invention will shortly be given.

HUNT, NEHEMIAH, of Massachusetts, United States. *Improvements in machinery for sewing cloth or other material.* (A communication.) Patent dated January 19, 1854. (No. 134.)

In this machinery needles are employed as usual, but the cloth is fed along by the intermittent rotary movement of a feeding-wheel, which is placed and made to revolve on a stationary shaft that serves as a support to one end of the driving-shaft. This feeding wheel is formed with a serrated or toothed periphery, and with a circular groove or channel in its inner side, concentric with its periphery.

RICKARD, CHARLES WILLIAM ROWLEY, of Great Charlotte-street, Blackfriars-road. *Improvements in cocks and taps.* Patent dated January 19, 1854. (No. 135.)

The inventor says, "Where clack valves are used, I cause the axis of the valve to form part of the valve, and to enter a recess made for it; at the upper part of the valve it is formed to receive the end of a screw in such a manner that by the screw rotating, the valve is caused to rise or fall."

DIRCKS, HENRY, of Moorgate-street, London, engineer. *Improvements in safety apparatus, applicable to certain boilers and stills.* Patent dated January 20, 1854. (No. 136.)

The inventor employs a refrigerator, either self-acting or otherwise, to reduce the temperature of liquids in boilers, stills, coppers, &c., when the fluids in them have acquired a temperature liable to occasion an explosion in closed, or the boiling over of open vessels. And he also uses peculiar indicators or gauges, and alarums, either to be connected with the refrigerator or employed independently.

CONDY, HENRY BOLLMAN, of Battersea, Surrey. *Improvements in the manufacture of*

*sulphate of soda, sulphate of potash, and other sulphates, and in the manufacture and employment of muriatic acid.* Patent dated January 20, 1854. (No. 137.)

The inventor says, "I take the products obtained in the manufacture of sulphate of soda or potash by the decomposition of one atom of muriate of soda or potash in the usual way, by one atom of sulphuric acid, and these products, which consist of a mixture of sulphate of soda with excess of acid and muriate of soda, when broken into pieces of about the size of an egg, and mixed so as to be as uniform as possible, are placed in a cylindrical or other shaped vessel, which is filled completely full, and heated to redness as evenly as possible, when a jet or jets of dry steam are introduced at one end, and allowed to pass through the mass and out at the other end of the vessel, by which means the remainder of the muriatic acid is liberated, and may be condensed together with the steam," and sulphate of soda is obtained nearly pure.

AITCHISON, EDWARD, lieutenant in the Royal Navy, of Manor-street, Cheyne-walk, Chelsea, Middlesex. *Improvements in apparatus for fixing, removing, and plugging tubes of tubular steam boilers.* Patent dated January 20, 1854. (No. 138.)

"The apparatus for fixing a tubular flue in a steam boiler consists of a bar having at one end a cone screwed thereto, and at the other the bar is formed with a screw, and another cone is slided over, so that when a tubular flue has been introduced into its place in a boiler, and the bar passed through it by causing the two cones to approach each other, the two ends of the tube will be opened out and thereby fixed."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in cutting out cloth and other fabrics and materials suitable for garments and furniture.* (A communication.) Patent dated January 20, 1854. (No. 139.)

This invention consists mainly in cutting several thicknesses of material by laying them upon a table or bed, and conducting them in a proper direction towards the edge of a knife which has a reciprocating rectilinear motion, and which enters or passes through the table or bed.

CHASE, OLIVER RICE, of Boston, State of Massachusetts, United States. *Pulverizing machinery.* Patent dated January 20, 1854. (No. 140.)

*Claim.*—"The combination of a series of rotative cells and stampers within a vessel of any suitable form, with machinery adapted to cause them to operate together upon the substances to be crushed."

SMITH, ROBERT ANGUS, doctor of philosophy, and ALEXANDER MAC DOUGALL, manufacturing chemist, both of Manchester, Lancaster. *Improvements in treating, deodorizing, and disinfecting sewage and other offensive matter, which said improvements are also applicable to deodorizing and disinfecting in general.* Patent dated January 20, 1854. (No. 142.)

This invention consists in the use of sulphurous acid, "which, when brought into contact with the offensive gases, causes their immediate decomposition, and consequent destruction of the smell." As it is more convenient to use the sulphurous acid in combination, the inventors employ as a base an alkaline earth, preferring magnesia and lime.

ROBERTS, RICHARD, of Manchester, engineer. *Certain improvements in machinery for cutting paper, pasteboard, leather, cloth, and other materials.* Patent dated January 21, 1854. (No. 144.)

*Claim.*—The use of racks and pinions for working the presses of machines for cutting paper, &c.

GRACE, GEORGE, and THOMAS FRANCIS JONES, both of Birmingham, Warwick. *Improvements in boots and shoes, as also boot and shoe socks or inner soles, whereby the same are rendered waterproof.* Patent dated January 21, 1854. (No. 148.)

This invention consists in rendering boots and shoes waterproof where the sole and upper leather are united, by the application between the upper leather and lining and the soles of any suitable waterproofing material, secured at the time that the welt and upper leather, or the upper leather and sole are put together.

WESTERTON, JOHN, of Earl's-court-road, Brompton, Middlesex. *An improvement in the manufacture of night-light boxes or cases.* Patent dated January 21, 1854. (No. 149.)

*Claim.*—The manufacture of night-light boxes or cases of pipe or other clay.

MOTAY, CYPRIEN MARIE TESSIÉ DU, chemist, of Rue Fontaine St. George, Paris. *Improvements in the manufacture of oil from rosin.* Patent dated January 21, 1854. (No. 150.)

In carrying out this invention, rosin is placed in a still with hydrate of lime or alkali, and distilled over, the oil obtained being mixed with hydrate of lime or alkali, and again distilled. It is then subjected to the action of sulphuric acid, and allowed to settle, and the clear oil is run off or separated, and is itself treated with sulphuric acid, &c., as before. It is next distilled, mixed with charcoal (animal or vegetable), or with charcoal and carbonated alkali, and is filtered through animal charcoal or other suitable matter. The residual matters thus produced are converted into lubricating materials.

Falk, Herman Eugene, of Gateacre-house, Liverpool, merchant. *Improvements in preparing or manufacturing salt.* Patent dated January 21, 1854. (No. 151.)

This invention consists in crushing rock-salt in the mines with hammers and stampers worked by manual power, and in then either hand-picking or riddling and shipping it. It also consists in mixing "granulated crystallized salt with patent butter-salt."

Spence, Peter, of Pendleton, near Manchester, Lancaster, manufacturing chemist. *Improvements in manufacturing the prussiates of potash and soda.* Patent dated January 21, 1854. (No. 153.)

The inventor says, "I use the sulphate of potash and the sulphate of soda instead of the potash and pearlash and the carbonate of soda now generally employed, and in place of obtaining cyanogen (for the production of these prussiates) from the animal matter now used, I employ old leather, such as old shoes or other refuse old leather, and operate upon it in the manner at present adopted."

Edwards, Charles John, of Great Sutton-street, Middlesex, leather hose and band manufacturer. *Improvements in the manufacture of bands for driving machinery.* Patent dated January 21, 1854. (No. 155.)

*Claim.*—Manufacturing bands for machinery by folding or doubling bands of leather so as to bring the edges together at the centre or other convenient part of the side of the band, and then securing them thereto by cementing, stitching, and riveting.

Shanks, Andrew, engineer, of Robert-street, Adelphi, Westminster. *Certain improvements in machinery for punching and shearing metals.* Patent dated January 23, 1854. (No. 156.)

*Claims.*—1. The use and application of an eccentric bush for regulating the stroke of the punch. 2. The application of a skin-toothed wheel with a spiral pinion to punching and shearing-machines. 3. The placing of the shears out of the centre of the machine, so that the force acts by pressing the blades closer together when cutting.

Armstrong, Charles Clarke, of Birmingham, Warwick, manufacturer, and William Pursall, of Birmingham aforesaid, manufacturer. *A new or improved percussion cap.* Patent dated January 23, 1854. (No. 157.)

This invention consists in forming a percussion cap in which the detonating powder is confined between two plates or sheets of metal, so that the powder is secured from moisture, and from the accidents to which the undefended detonating powder is exposed in the ordinary percussion cap.

Robinson, Thomas, of Farringdon-street. *Improvements in apparatus for filtering volatile liquids.* Patent dated January 23, 1854. (No. 160.)

This apparatus consists of a funnel-shaped vessel formed of glass, earthenware, or metal, having a cap or cover which fits fluid-tight, so as to admit of the filtering-paper being introduced. The upper part of the cap is formed with an opening, through which the liquid to be filtered is poured, and this opening is closed by means of a stopper fixed to the end of a flexible tube, having fixed to its other end another stopper, which enters an orifice in the receiver. The funnel-shaped vessel also enters the receiver and fits air tight in it.

Muir, Matthew Andrew, of Glasgow, Lanark, North Britain, machinist. *Improvements in weaving.* Patent dated January 23, 1854. (No. 161.)

Among other things the inventor describes a mode of working the pattern or segment-wheel action of looms for weaving checks and similar patterns by means of a catch or ratchet-wheel and pall arrangement, actuated by a cam on the tappet shaft of the loom.

Lockhart, John, junior, of Paisley, Renfrew, North Britain, wood-turner. *Improvements in the manufacture of bobbins.* Patent dated January 23, 1854. (No. 162.)

The inventor describes a mode of cutting out bobbin-blanks from a block of wood or other material by means of a revolving tubular or crown saw or cutter, in combination with a drill for forming the centre hole, the two tools being made to act simultaneously on the wood, and to enter it in opposite directions; also an apparatus for feeding in the wood.

Seebohm, Henry, of Esholt, near Leeds. *Improvements in combing wool, goats'-hair, alpaca, cotton, and other fibrous material.* Patent dated January 23, 1854. (No. 165.)

These improvements "consist in arranging surfaces of comb teeth or other points, so that they receive wool or other fibre in lengths or stricks from an endless apron or other feeder, the lengths of fibre being laid successively across the surface of points and being pressed thereon by a brush or other suitable surface; and when the surfaces of points have thus taken the fibre to be treated, they are caused gradually to divide, and in separating their line of separation will be parallel to that in which the fibres have been laid on to the point-surfaces, by which each portion of point-surface will hold one end of some of the fibres, whilst the other portion of point-surface will hold one end of other of the fibres, and the other ends of the fibres or the opposite ends to those held by one or other of the comb-surfaces will, in the separation of the point-

surfaces, be drawn through one or other of them, and thus be combed out."

WESTLAKE, JOHN, of Totnes, Devon, mine agent. *Pulverizing, washing, separating, amalgamating, and otherwise treating ores, gossans, earths, and rocks, so as the better to obtain and extract therefrom the gold and other metals and minerals which may be contained therein.* Patent dated January 23, 1854. (No. 167.)

A full description of this invention forms the first article of this Number.

*** The documents of Nos. 116 and 124 are with the law-officers under 1st reference.

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BROWN, WILLIAM, of the parish of St. George, Camberwell, Surrey, engineer. *Improvements in printing-machinery.* Application dated January 17, 1854. (No. 106.)

This invention consists in an arrangement of apparatus by which two or more colours may be printed on the same sheet of paper at the same time, without disengaging the paper from the cylinder.

CROSSKILL, WILLIAM, of Beverley, York, civil engineer. *An improvement in the construction of carriage-wheels to run on railways and ordinary roads.* Application dated January 17, 1854. (No. 107.)

This invention consists in making the wrought-iron rim or tire of two different diameters, so that the same wheels may be worked on railways and on common roads without altering the wheels.

MACLAREN, ROBERT, of Glasgow, Lanark, North Britain, engineer. *Improvements in moulding or shaping metals.* Application dated January 17, 1854. (No. 110.)

This invention relates to a modification of the general system of moulding metals, for which the inventor has previously applied for provisional protection, consisting in means for securing an effectual moulding action at one general operation by means of great pressure.

WEBER, KARL, of Rechtberg, Wurtemberg. *Improvements in the manufacture of boots and shoes.* Application dated January 17, 1854. (No. 112.)

This invention consists in connecting the parts of boots and shoes together entirely by wooden pegs.

CAHILL, CHARLES STAUNTON, of Greenwich, Kent, and Annadown, Galway, Ireland, Esq. *Improvements in submarine, subterranean, and other electric and magnetic telegraphs, and in insulating, laying down, joining, and covering the same.* Application dated January 18, 1854. (No. 117.)

The main features of this invention consist in employing as an insulating wire "a new material, consisting of a preparation mostly of paper, applied in pulp or otherwise, and rendered anhydrous, non-conducting, and capable of resisting considerable heat, damp, pressure, and water;" in covering submarine and electric and other cables with flat or corrugated hoop-iron formed in strips of any breadth; and in rapidly joining these cables and conductors by a peculiar joint.

BATTEN, WILLIAM, surgeon, of Westbourne-street, Pimlico, Middlesex. *An improvement in the construction of a sink, drain, or gulley-trap, named the self-acting effluvium trap, for the more effectual conveyance of all liquids or admixtures in passing into drains, sewers, cesspools, or other receptacles, and the better prevention and exclusion of all vapours, effluvia, or gases arising therefrom.* Application dated January 18, 1854. (No. 118.)

The inventor constructs a chamber, the outer casing or lid of which is a perforated plate or grating, through which all liquids or admixtures enter, and the bottom of which terminates with an open pipe for conveying them away. To the under surface of the lid is attached a tube open at its lower extremity, having arms or lateral projections to secure it in the centre of the chamber. And over and upon the internal opening of the pipe, at the lower part of the chamber, is placed a ball, so as to prevent the entrance of all noxious vapours into it; while over the ball is the lower opening of the interior tube, within which the ball acts, and which is attached to the under surface of the lid or grating.

GREENSHIELDS, WALTER, of Edinburgh, Midlothian, North Britain, manager. *Improvements in chenille fabrics.* Application dated January 18, 1854. (No. 119.)

In this invention the fringes of the fabrics are woven or manufactured in the ordinary manner, with the exception that yarns of various colours are worked into them, according to the usual system of manufacturing figured or parti-coloured fabrics in the loom.

BOURQUIN, JEAN PIERRE, of Newman-street, Middlesex, dealer in photographic apparatus. *Improvements in or applicable to troughs or vessels for holding liquid substances required in the art of photography.* Application dated January 18, 1854. (No. 125.)

The primary feature of this invention consists in making the troughs of a square, rectangular, or other conveniently-shaped framework of wood, in which a glass bottom is fixed by means of a cement which is not liable to be acted upon by the chemical solutions employed; and the inventor adopts an improved mode of levelling the vessel, which consists mainly in adapting to the

framework of it three or more levelling-screws.

GUYON, HELOISE, of Paris, France, widow. *Improvements in the manufacture of bread.* Application dated January 19, 1854. (No. 131.)

This invention consists in effecting the more perfect development of the gluten contained in the flour by means of vinous fermentation.

BROWNENTT, HENRY, of Liverpool, Lancaster, merchant. *Treating scrap and waste iron so as to render the same more readily available in the manufacture of iron.* Application dated January 19, 1854. (No. 132.)

The inventor takes scrap and waste iron, and collects it together in a box, frame, or binder, and submits it to great pressure, thus forming the same into blocks or masses convenient for stowage and carriage.

FIELD, JAMES JOHN, of Charles-terrace, Middlesex, gentleman. *Improvements applicable to guns, cannon, or ordnance, rifles, and other similar implements of war or the chase, for more accurately aiming at the object to be struck by projectiles.* Application dated January 20, 1854. (No. 141.)

This invention consists in adapting to a gun or rifle a telescope provided with fine cross lines, such as are usually adapted to the telescopes of levels, theodolites, &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of stays or corsets.* (A communication.) Application dated January 20, 1854. (No. 143.)

This invention relates to the manufacture of what are known as woven corsets, and consists in the employment of the Jacquards in the loom, one of which effects the shape or contour of the corset, and the other the formation of the double portions or slots for the introduction of the whalebones.

BEAUDELOUX, MARIE LOUISE LISE, of Paris, France, spinster. *A self-acting cradle, with improved mattress.* Application dated January 21, 1854. (No. 145.)

The inventor places clock or wheelwork in such a position that, by the assistance of certain levers or arms attached to portions of the framework, and communicating with the wheelwork, when the latter is wound up, the cradle will be set in a gentle rocking motion. The improved mattress need not be described, although nurses might find it useful in saving them trouble.

BEAUDELOUX, MARIE LOUISE LISE, of Paris, France, spinster. *A candlestick working by machinery, so as to keep the candle always at the same height in a tube, with a shade of a peculiar construction, so as to augment greatly the quantity of light.* Application dated January 21, 1854. (No. 146.)

The title of this invention indicates its character; it may, however, be well to state that the mechanism for working the candle is somewhat similar to that of a Carcel lamp, and is placed in the body of the lamp.

VENABLES, THOMAS BOULTON, of Burslem, Stafford. *Certain improvements in the manufacture of earthenware.* Application dated January 21, 1854. (No. 152.)

This invention consists in preparing compounds or mixtures from which white earthenware bodies may be manufactured.

WARREN, DANIEL, of Exmouth, Devon, gentleman. *Improvements in raising, pumping, or forcing water.* Application dated January 21, 1854. (No. 154.)

This invention consists in an arrangement or combination of syphon pipes with a flexible bag containing a volume of compressed air, and enclosed in a rigid or metal case or chamber, which is made to act on water supplied to the latter chamber.

DARLING, WILLIAM, of Edinburgh, Scotland, merchant. *Improvements in sewing-machines.* (A communication.) Application dated January 23, 1854. (No. 158.)

On the main shaft of this machine are fixed two eccentrics, one on each side of the driving-pulley; and on the end of the said shaft is mounted a circular shuttle formed to receive a circular metallic bobbin, and with an opening through which the thread may pass from the bobbin, which is kept in place by means of a ring mounted on a kind of bracket, through a part of which a set screw is passed.

ROWLANDS, JOSEPH, of Ladywood-lane, Birmingham, Warwick, saddler. *An improved fastening to be used instead of buttons, buckles, clasps, snaps, hooks-and-eyes, and other similar fastenings.* Application dated January 23, 1854. (No. 159.)

The inventor describes a mode of fastening which is so arranged that slackening or disturbance cannot loosen it.

TAYLOR, JOHN GEORGE, of Glasgow, Lanark, North Britain, merchant. *Improvements in treating the fleeces or natural coverings of sheep and other animals, when on the animals.* Application dated January 23, 1854. (No. 163.)

The inventor describes a dressing material "composed of the oil derived from the distillation of common coal, parrot-coal, the Boghead or Torbane mineral or other mineral of the like class, mixed with 25 per cent., more or less, of rosin, resin, or resinous matters."

TAYLOR, JOHN GEORGE, of Glasgow, Lanark, North Britain, merchant. *Improvements in lamps, and in substances to be burned therein.* Application dated January 23, 1854. (No. 164.)

The main feature of this invention consists in the use of an oil obtained by the dis-

tillation of the substances enumerated in the previous abstract, the per centage of the resinous matters being 50 instead of 25.

GETTY, JOHN, of Liverpool, Lancaster, ship-builder. *Improvements in the manufacture of tubular bridges, part of which improvements is applicable also to the preparation of plates for covering iron ships, for constructing boilers, and for other analogous uses.* Application dated January 23, 1854. (No. 166.)

This invention relates, firstly, to certain means for facilitating the marking of the bolt-holes in the plates employed in constructing tubular bridges; and, secondly, to a mode of determining the shape to which plates, whether employed in constructing bridges, ships' boilers, or other metal work, are required to be cut to fit the space which they are to occupy.

## PROVISIONAL PROTECTIONS.

*Dated June* 10, 1854.

1281. John Braithwaite, of Gower-street, Middlesex, civil engineer. An improved method of roofing or covering buildings, reservoirs, and other spaces requiring roofs or coverings.

*Dated June* 19, 1854.

1328. Thomas Mara Fell, of King William-street, London, and William Cooke, of Curzon-street, Hanover-square, Middlesex. Improvements in bottles and bottle-stoppers, and in stopping and applying the same.

*Dated June* 30, 1854.

1438. John M'Gaffin, of Liverpool, Lancaster, engineer. Improvements in the manufacture of iron casks and cisterns.

*Dated July* 6, 1854.

1479. Samuel Harvard, of Stoke Holy Cross, Norfolk, and Joshua Womersley, of Stoke Holy Cross, Norfolk. Heating crushed seed for making cake, for drying seeds, corn, and other grain, and for feeding millstones or other grinding apparatus.

1481. John Arrowsmith, of Bilston, Stafford, engineer. A new or improved method of consuming or suppressing smoke and obtaining motive power therefrom.

1483. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in apparatus for breaking in horses. A communication.

1487. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes. A communication.

1489. James Edward M'Connell, of Wolverton, Bucks, civil engineer. Improvements in wheels, axle-boxes, and brakes for railway carriages.

1491. William Pole, of Storey's-gate, Westminster, civil engineer. Certain improvements in the construction of railways.

*Dated July* 7, 1854.

1493. William Lacey, of Lozell's-lane, Aston-juxta-Birmingham, Warwick, agent. A new or improved method of making copper rollers, cylinders, and tubes.

1494. Andrew Morison, of Inchmichael, Perth, Scotland, farmer. An improved mode of protecting or preserving agricultural and horticultural produce from disease or blight.

1495. George Beard and William Beard, both of Cannon-street, London, pin and needle manufacturers. An improved needle-depositor.

1496. Jesse Ross, of Keighley, York, gentleman. Improvements in making compounds of chocolate, cocoa, and other ingredients for breakfast, and occasional beverages.

1497. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of pump for raising and forcing fluids. A communication.

1498. James Lee Norton, of Holland-street, Blackfriars, Surrey, gentleman. Improvements in turnstile counting apparatus.

1499. Joseph Ellisdon, of Liverpool, Lancaster, designer and cabinet-maker. Improvements applicable to reading, lounging, and other chairs.

1500. Henry Richard Cottam, of Argyle-square, King's-cross. Improvements in horse-mangers.

*Dated July* 8, 1854.

1502. William Robinson, of Manchester, Lancaster, screw bolt-maker, and Robert Crighton, of the same place, engineer. Improvements in machinery or apparatus for rolling metals into suitable shapes or forms.

1506. Felix Lieven Bauwens, of Pimlico, Middlesex, manufacturer. Improvements in the manufacture of soap.

1508. Edward Lord, of Todmorden, York, machinist. Improvements in machinery for cleaning and carding cotton and other fibrous materials.

*Dated July* 10, 1854.

1510. Stephen Martin Saxby, of South Lambeth, Surrey, gentleman. An improvement or improvements in making fast, and letting go, the cords of window-blinds, which said improvement or improvements may also be applied to the fastening and letting go of ropes, cords, lines, wires, and chains, for various other purposes.

1512. George Arthur Biddell, of Ipswich, Suffolk, engineer. Improvements in machines for cutting vegetable and other substances.

*Dated July* 11, 1854.

1514. Edwin Wolverson, of Aston-juxta-Birmingham, Warwick, machinist. A new or improved lock.

1516. Matthias Walker, of Horsham, Sussex, ironmonger. An improved construction of cooking-stove.

1518. Charles Frederick Moore, of Portswood-park, Southampton, Hampshire, gentleman. Improvements in the construction and use of an apparatus, closet, or receptacle, to be used instead of a water-closet or other necessary, and which may be either fixed or portable.

*Dated July* 12, 1854.

1522. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. An improvement in the manufacture of printed receipt stamps.

1524. Oliver Maggs, of Bourton, Dorset. Improvements in thrashing-machines.

1526. John Knowelden, of Church-road, Battersea, Surrey, engineer. Improvements in steam-boiler and other furnaces.

1528. Robert Armstrong, of Hall-street, City-road, Middlesex, consulting engineer, and James Bernard Dew, of Pentonville, Middlesex, gentleman. An improved apparatus for consuming smoke.

1530. Josiah Thompson Marshall, of New York, United States of America, gentleman. Improvements in reefing and furling the sails of ships or other vessels.

1532. James Robertson, of Kentish Town, Mid-

dlesex, cooper. Improvements in the consumption or prevention of smoke.

1534. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in preserving animal substances. A communication.

*Dated July* 13, 1854.

1536. Arthur James Lane, of Surbiton, Surrey, gentleman. Improvements in breech-loading firearms.

1538. John Greenwood, of Irwell Springs, near Bacup, Lancaster, Turkey red dyer, and Robert Smith, of Bacup, manufacturer. Certain improvements in sizeing, stiffening, and finishing textile materials or fabrics.

1540. Edwin Travis, of Oldham, Lancaster, cotton-spinner and manufacturer. Certain improvements in machinery or apparatus for indicating and registering the height of water, and also the pressure of steam in steam boilers or generators.

1542. Rudolph Bodmer, of Thavies-inn, Holborn, London. The application of glass, crystal, or other vitreous material, or of earthenware (céramique) to certain parts of machinery. A communication.

*Dated July* 14, 1854.

1546. William Bishop, of Boston, Lincolnshire, gentleman. Improvements in machinery or apparatus for ticketing or labelling spools, parcels of the same, or other similar parcels.

1548. Martin Wiberg, of Lund, Sweden, but now of Myddelton-square, Middlesex, doctor of philosophy. Improvements in the construction, setting up, and distribution of types for printing.

1550. John M'Gaffin, of Liverpool, Lancaster, engineer. Improvements in the construction of iron bridges.

1552. Astley Paston Price, of Margate, Kent, chemist. Improvements in the distillation of wood and of other vegetable substances.

*Dated July* 18, 1854.

1572. James Barlow, of Accrington, Lancaster, machinist. Improvements in the mode or method of extracting gluten from wheat or flour, and preparing the residuum for sizeing purposes.

1574. Mary Caroline Hill, of Dublin, milliner. An improvement in bonnets and in bonnet-frames.

1576. Richard Hornsby, of Spittlegate Iron Works, Grantham, Lincoln. An improvement in the straw shaking apparatus of thrashing-machines.

1578. George Twigg and Arthur Lucas Silvester, of Birmingham, Warwick, manufacturers. Improvements in apparatus or machinery for stamping or pressing metals.

1580. William Beckett Johnson, manager for Messrs. Ormerod and Son, of Manchester, Lancaster, engineers and iron founders. Improvements in steam-engines.

1582. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in zincography. A communication.

*Dated July* 19, 1854.

1584. John Collis Browne, physician, of Rodney-terrace, Cheltenham, Gloucestershire. Improvements in the manufacture of camp bedsteads.

1586. James Longley, of Hunslet-road, Leeds, York. A machine for turning and finishing tubs, pails, casks, and other wooden vessels of an elliptic, oval, or other eccentric form.

1588. Matthew Michell, of Stoke Newington, Middlesex, brewer. An improvement in furnaces having for object the consumption of smoke.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1606. Nicholas Callan, of Maynooth College, Kildare, Ireland, professor. A means by which iron of every kind may be protected against the action of the weather and of various corroding substances, so that iron thus protected will answer for roofing, for cisterns, baths, gutters, window-frames, telegraphic wires, for marine and various other purposes, and by which brass and copper may be similarly protected. July 21, 1854.

1607. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in breech-loading firearms. A communication. July 21, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 1*st*, 1854.)

655. Edward Esnouf, Charles Mauger, junior, and George Washington Lewis. Improvements in portable dwellings and vehicles for travellers or emigrants.

697. Edward Bagot. Improvements in the manufacture of rails for railways.

701. Thomas Gibson and William Knighton. Improvements in moulding and casting metals.

763. Giuseppe Devincenzi. Improvements in producing ornamented and figured surfaces, and surfaces for printing from; also the hardening or preparing of certain objects to be employed in the process.

794. Auguste Edouard Loradoux Bellford. Improvements in sewing-machines. A communication.

834. Henry Gilbee. Improvements in the construction of axle-boxes and axle-bearings. A communication.

868. Giuseppe Devincenzi. A method or methods of producing engraved, figured, and typographic surfaces for printing and embossing from, and for ornaments; also certain machinery employed therein.

875. Alexander Chaplin. Improvements in the application of cast iron to building purposes.

890. Julian Bernard. Improvements in the manufacture of boots and shoes, and in the machinery or apparatus connected therewith.

891. Julian Bernard. Improvements in stitching, and machinery and apparatus connected therewith.

1167. Louis Michel François Doyere. Improvements in purifying grain.

1181. James Murdoch. Improvements in toy pistols. A communication.

1186. John Evans. Improvements in the manufacture of ornamental paper and paper bands.

1215. Charles King and Edward Sutton Benfield. Improved machinery for cutting and carving wood, stone, and other materials.

1225. Edward Orange Wildman Whitehouse. Improvements in effecting telegraphic communications.

1278. Benjamin Cook. Certain improved means of ornamenting metallic bedsteads, chairs, and couches, which said improvement is also applicable for ornamenting standards for glass frames, tables, and fire-screens, cornice-poles, and other articles of furniture.

1343. Charles Reeves and William Wells. A new or improved method of manufacturing certain kinds of metallic tubes.

1357. Henry Vernon Physick. Electric telegraphs, and apparatus connected therewith.

1420. Peter Armand Lecomte de Fontainemo-

reau. Improvements in the construction of axle-boxes. A communication.

1438. John McGaffin. Improvements in the manufacture of iron casks and cisterns.

1440. John Henry Johnson. Improvements in machinery or apparatus for winding thread or yarns. A communication from Louis Joseph Nicolas Carpentier.

1452. William Balk. An improved friction dynamometer.

1489. James Edward McConnell. Improvements in wheels, axle-boxes, and brakes for railway carriages.

1495. George Beard and William Beard. An improved needle-depositor.

1496. Jesse Ross. Improvements in making compounds of chocolate, cocoa, and other ingredients for breakfast and occasional beverages.

1512. George Arthur Biddell. Improvements in machines for cutting vegetable and other substances.

1516. Matthias Walker. An improved construction of cooking-stove.

1524. Oliver Maggs. Improvements in thrashing-machines.

1550. John McGaffin. Improvements in the construction of iron bridges.

1552 Astley Paston Price. Improvements in the distillation of wood and of other vegetable substances.

1576. Richard Hornsby. An improvement in the straw-shaking apparatus of thrashing-machines.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council by William Ryder, of Bolton, in the county of Lancaster, roller and spindle-maker, praying Her Majesty to grant a prolongation of the Letters Patent granted to him June 23rd, 1841, for "Certain improved apparatus for forging, drawing, moulding, or forming shafts, spindles, rollers, bolts, and various other like articles."

On the 16th September next, an application will be made to that Committee to fix an early day for the hearing of the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed July* 28, 1854.

247. Henry Wickens.
256. Alfred Daniel.
275. Pierre Joseph Meeus.
297. Henry Olding.
313. François Vouillon.
314. James Samuel and Alexander Woodland Makinson.
316. Eugéne Boileau.
426. Edward Taylor.
446. Charles Cowper.
468. William Edwards Staite.
500. Simon Roussel.
504. Thomas Truscott and Thomas Palmer Baker.
576. Peter Armand Lecomte de Fontainemoreau.
686. Moses Poole.
724. Frederick William Harrison and Henry Graham William Wagstaff.
762. William Gossage.
886. David Tannahill.
984. William Edward Newton.
1220. Owen Rowland.

*Sealed August* 1, 1854.

266. Frederic Henry Sykes.
292. Peter Trumble.
318. Pierre Joseph Meeus.
322. William Dray.
364. William Asbury.
1180. Joseph Hipkiss.
1244. Walter Crum and Peter Stewart.
1254. William Thomas Parkes.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| June 30 | 3607 | P. and F. Schafer | Brewer-street | Nozzle-lock. |
| ,, | 3608 | Bland and Long | Fleet-street | A camera. |
| July 1 | 3609 | Sir T. F. J. Boughey, Bart. | Aqualate-hall, Staffordshire | Lawn-rake. |
| 5 | 3610 | Price's Patent Candle Company. | Vauxhall | Emigrant ship-lanthorn. |
| 7 | 3611 | J. C. Hall | Monk Wearmouth | A self-acting stopper. |
| ,, | 3612 | J. C. Hall | Monk Wearmouth | Improved steering-apparatus. |
| 8 | 3613 | J. Wright and Sons | Saltby Works | Railway-buffer. |
| ,, | 3614 | W. Young | Queen-street, Cheapside | A hot-water warming-pan. |
| ,, | 3615 | T. Toms | Aldermanbury | A reversible neck-tie. |
| 15 | 3616 | O. Maggs | Bourton, Dorset | Sack-holder. |
| 19 | 3617 | W. J. Clapp and G. Fast | Newport, Monmouthshire; Shaftesbury-crescent, Pimlico | Torniquet and compress. |

| Date. | No. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| July 19 | 3618 | A. Grant, Brothers | Wood-street | Belt-clasp. |
| 20 | 3619 | G. Graham | Leeds | Washing-machine. |
| 21 | 3620 | J. J. Bennett | Dover | Sewer-centring. |
| 22 | 3621 | J. J. Gait | Portsmouth | Sea-chest. |
| 25 | 3622 | J. Sinclair | Liverpool | Railway information. |
| 28 | 3623 | J. Voile | Manchester | Telegraph-pipe. |
| Aug. 1 | 3624 | E. Kesterton | Long-acre | Amempton sociable. |
| 3 | 3625 | J. Mogg and Co. | Redditch | Needle-wrapper. |

LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| July 7 | 590 | C. J. Recordon | Regent's-park | Square and cubic-root extractor. |
| 17 | 591 | G. G. Bussey | High-holborn | Gun-case. |
| " | 592 | H. Brown | Southwark | Chair and couch bedstead. |

## NOTICES TO CORRESPONDENTS.

*R. H. S.*—We regret that we find it necessary again to defer our replies to your questions.

*T. V.*—As steatite or soapstone is a substance applicable to a great variety of uses, and one which is just now being employed for new purposes, we shall publish (probably in our next number) an article relating to it which has just come under our notice.

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dub in; W. C. Campbell and Co., Hamburg.

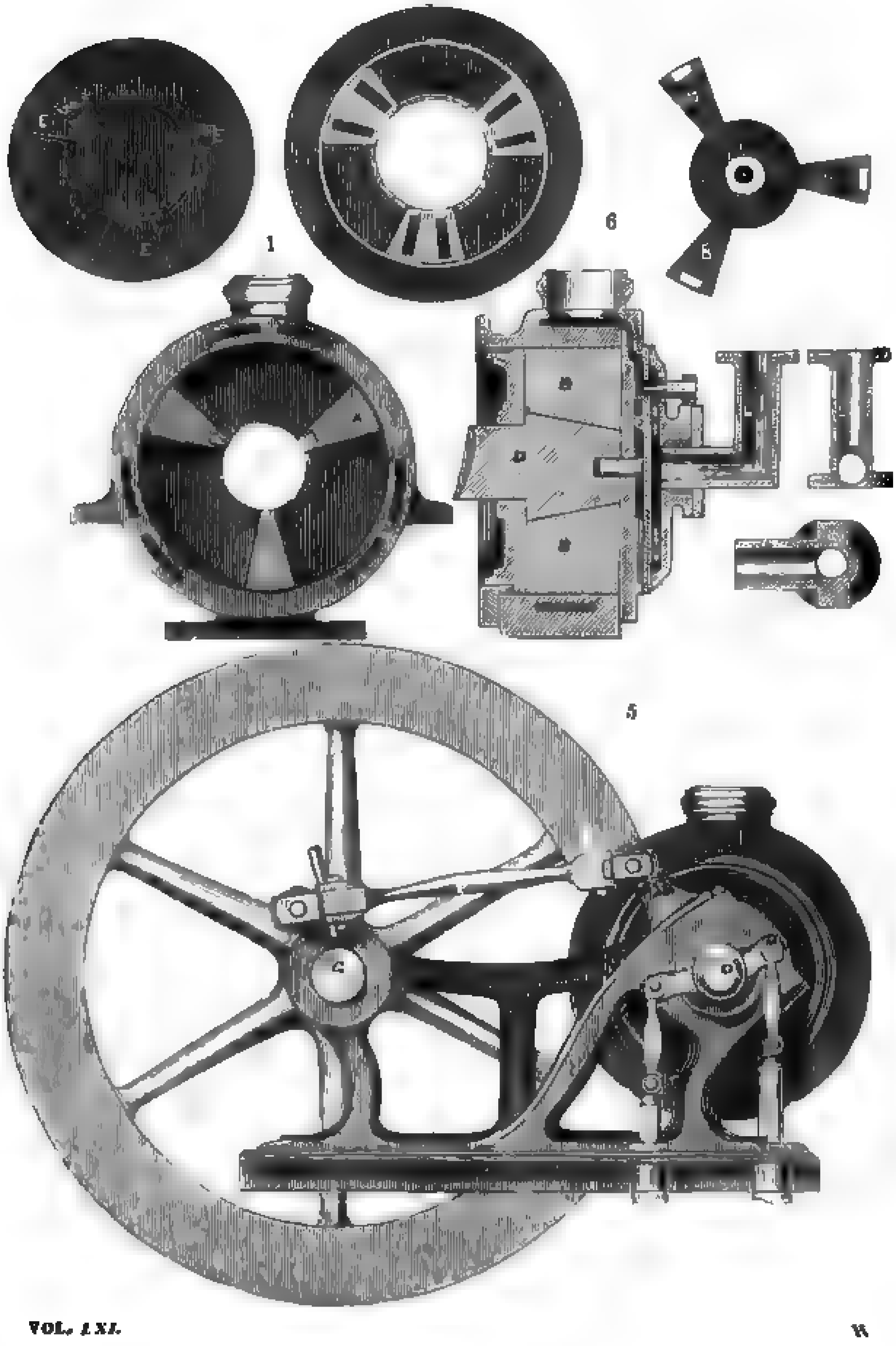
# Mechanics' Magazine.

No. 1618.] SATURDAY, AUGUST 12, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## DAVIS AND RAMSAY'S PATENT VIBRATING ENGINE.

Fig. 2. Fig. 3. Fig. 4.



## DAVIS AND RAMSAY'S PATENT VIBRATING ENGINE.

(Patent dated September 6, 1853.)

MESSRS. DAVIS AND RAMSAY, of the Low Furness Ironworks, near Ulverston, have patented an engine to be driven by steam or other fluid, which is constructed as follows:

A cylinder is provided internally with two, three, or more fixed steam stops projecting radially from its sides towards the centre; and a central shaft passing through the cylinder is mounted therein in such a manner as to fit steam-tight against the inner edges of these steam stops. This central shaft is provided with radial pistons, which are fixed thereon, and correspond in number to the steam stops in the cylinder. "Now supposing," say the patentees, "there are three steam stops, the cylinder will be divided internally into three compartments or chambers, each of which will be provided with a piston secured to the main central shaft, and is made to vibrate in its chamber when steam is admitted therein through suitable valves at the end of the cylinder. On one end of the central shaft is mounted a crank or lever which, by means of a connecting-rod, communicates motion to another crank on the shaft or axle to be driven." It will be understood that as the pistons are made to vibrate they will communicate a vibratory motion to their shaft, and by means of the connecting-rod and crank transmit a rotary motion to the second shaft or axle to be driven. The same construction of parts is applicable to air-pumps to be employed for condensing engines or otherwise; the only change requisite for this application of the invention being a modification of the valves.

Fig. 1 of the engravings on the preceding page is a transverse vertical section of the cylinder, showing the radial or wedge-shaped partitions, A,A,A, whereby the interior of the cylinder is divided into three compartments. Fig. 2 is an elevation or front view of the face of the valve. Fig. 3 is an elevation of the end of the cylinder, the valve and other contiguous parts belonging thereto having been removed in order to show the steam ports. Fig. 4 is an end view of the piston, C, which is composed of three wing pieces or radial arms, B, B, B. Fig. 5 is a view of one end of the engine, showing the lever, *h*, upon the piston-shaft, D, which is connected with the crank, F*, on the fly-wheel shaft by the rod, E*. Fig. 6 is a vertical section taken through the cylinder, valves, and steam pipes. "It will be seen that by this mode of constructing and arranging the valve and steam-chest, a great saving is effected in the cost of making the engine, besides reducing the wear and tear of the valve, as the steam is made to press on the back of the valve as well as the face."

The operation of some of the working parts is as follows:—Steam is admitted through the pipe, L, which is supported in the bracket, *c*; it then passes into the valve, as shown by the arrows in fig. 6, and then between the face plate and the back plate of the valve. Both these plates are connected and move together, and the space between them forms the steam-chest, or answers the purpose of one. The valve-plates are not kept in their situation by any collar or other similar mechanical contrivance, but solely by the difference of pressure between that exerted by the steam upon a surface equal to the area of the steam pipe outside the measurement and the area of the ports.

"The adjustment of the pressure is effected simply by making the area of the steam pipe (inside measurement) equal to the area of the other parts collectively; the difference of pressure between that upon the area of the inside measurement of the steam pipe and the area of the outside measurement thereof, being all the pressure that is exerted upon the valve-plate, or is required to keep the parts together."

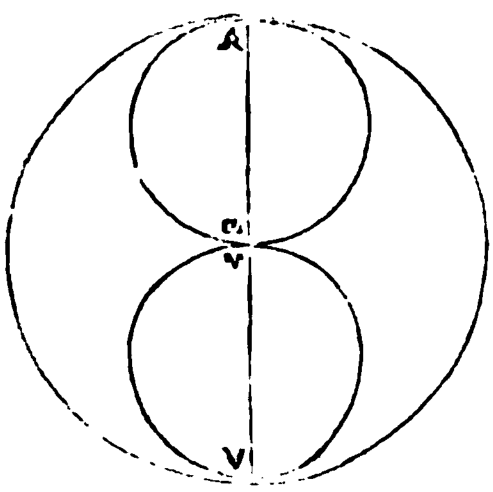
Steam being admitted in the cylinder at three places simultaneously, or nearly so, will exert its elastic force against the stationary steam stops, A, A, A, of the cylinder, as shown in fig. 1, and the moveable radial arms, B, B, B, of the piston-shaft, D, and by so doing will force forward the arms, B, and cause the shaft, D, to turn on its axis. During this motion, however, the steam will be cut off, and afterwards admitted to the opposite side of the radial arms, B, when the latter will be driven back again, and so on, thereby causing the shaft, D, to vibrate in its bearings, and by means of a crank or arm, to communicate rotary motion to the fly-wheel shaft through the intervention of a suitable connecting-rod.

## ON THE MANIFESTATION OF POLARITY IN THE DISTRIBUTION OF ORGANIZED BEINGS IN TIME.

PROFESSOR E. FORBES recently delivered a very interesting lecture, on the above subject, at the Royal Institution, in which he put forward suggestions which are well worthy of philosophic consideration. The following is an abridged report of his remarks:

Of the four relations among organized

beings, viz., affinity (or relation through homology), analogy, representation, and polarity, the three first have been recognized in the distribution of beings in geological time; the fourth has neither been observed nor sought for. The term itself is one not familiar in the language of natural history, although proposed many years ago by the Swedish botanist, Fries, and systematically employed by several naturalists for some time past. The word "polarity" seems objectionable, since it has been appropriated with a peculiar signification by physical philosophers. The sense in which it is employed by naturalists, that of a manifestation of force of development at opposite poles of an ideal sphere, cannot however be indicated by any other word at present invented, implying, as it does, something very different from *divergence* and from *antagonism*, words which have been suggested as substitutes. The ordinary illustration of the relation of *polarity*, in a natural history sense, is that representing the relation of opposition or




progression in opposite directions of the animal and vegetable series; the meeting point of both being at the points of lowest development of each ($a$, $v$, in the accompanying diagram),* where the animal and vegetable natures are almost confounded, whilst the strongest manifestations of each are at A and V, the highest animals being farthest removed from the highest vegetables; in other words, at opposite poles of the sphere of organized beings.

The earnest desire implanted instinctively in every inquiring mind, to discover a law or scheme in arrangements of nature, has given origin to many speculations concerning the distribution of life in geological time, all of them founded on facts more or less clearly understood. Hence have arisen the hypothesis of an evolution of all organized types, during the course of time, from one rudimentary prototype; that of the succession of distinctly originating forms of animals and vegetables in order of the progression within their respective series; of the coeval starting of the great groups wholly or mostly at the beginning, but in each instance by the lower forms of the type; of the representation by the faunas and floras of geological epochs; of the successive zones of life belting the geographical regions between the poles and the equator; of an uniformity of life arrangements throughout time and repetition through substitution of equal and similar groups; and of manifestations in the distribution of life in time of analogies that are essentially theological.

For several years I have been persuaded that the simple and unquestionable phenomena of substitution of groups by representative groups, manifested in the arrangements of the faunas and floras of all geological epochs, and comparable with like phenomena exhibited by the geographical distribution of existing organized beings, would prove sufficient for the explanation of all the appearances that have suggested such speculations, some purely hypothetical, some fairly theoretical, as those I have just indicated. The apparent contradictions and unexplained peculiarities presented by the more ancient epochs as contrasted with the middle and newer ones seemed to depend on the incomplete state of our knowledge, and to be possibly explainable by supposing that of some great geological epochs in time we had as yet discovered no traces. Thus the great gap between the Palæozoic and Mesozoic life might depend upon our not yet having discovered traces of the rudimentary formations that had been deposited during the interval between the Permian and Triassic epochs.

But the rapid accumulation of palæontological facts gathered within the last very few years, and the great additions that have been recently made towards our knowledge of the Palæozoic fauna, all mainly in accordance with facts known before, have satisfied me that the explanation offered above does not sufficiently meet the full truth, and that the various theories concerning progression, development, &c., have all originated in the obscure perception and imperfect interpretation of the workings of some great law in the distribution of organic beings in time.

It is no longer possible, in the face of palæontological evidence, to hold any of the notions cited. The scale of the first appearance of groups of beings of any degree is most clearly not one of organic progression. Suitable conditions have been met by the creation of suitable types; no type, whether generic and therefore ideally manifested, or specific and therefore manifested actually

* The upper of the small circles represents the animal, and the lower the vegetable kingdom.

and through individuals, visibly, being found to be ever repeated in time, when the full history of either is made out. This is a great law and a grand result of geological research. Nevertheless, in the relative arrangements, so to speak, of generic types in time, there is an indication of the working of a general law of another kind, and one which seems to me to depend on *the manifestation of the relation of Polarity.*

We are accustomed to group all geological epochs under three great sections, the Palæozoic, or oldest, the Mesozoic, or middle, and Cainozoic, more commonly termed Tertiary, or newest. If we consider the faunas (and floras) of these three great sections, we cannot but perceive that there is a far stronger affinity between the Mesozoic and Tertiary epochs than between the Mesozoic and Palæozoic. This is especially manifest when we regard the details of the distribution of those preservable forms of animal life, which being inhabitants of the medium in which sedimentary strata are deposited, are most likely to afford an approach towards complete evidence. On the other hand, the forms of life that characterise the Palæozoic formations, the products of a vast succession of time-periods have, when regarded in their totality, a wonderful agreement and relationship among themselves.

For this reason I propose to denominate the sum of the epochs after the Palæozoic, by the name of Neozoic.

Now if we regard these two great periods separately, we find that the manifestation of generic types during each, exhibits striking and contrasting phenomena. *The maximum development of generic types during the Palæozoic period was during its earlier epochs; that during the Neozoic period towards its later epochs.* And thus, during the Palæozoic period, the sum of generic types and concentration of characteristic forms is to be observed in Silurian and Devonian formations; during the Neozoic period it is during the Cretaceous, Tertiary, and present (itself part of the Tertiary) epochs that we find the maximum development of peculiar generic types (or ideas.) On the other hand, during the closing epochs of the Palæozoic and the commencing epoch of the Neozoic period there was a poverty in the production of generic ideas, with few exceptions the species of the epochs in question being members of genera that form constituents in the assemblage, accumulated during the epochs of maximum of generic types or ideas.

The following table may render my meaning more evident:

| | | |
|---|---|---|
| Neozoic period. | Present and Tertiary epochs | Epoch of maximum development of Neozoic Generic types. |
| | Cretaceous epochs. . . . | |
| | Oolitic epochs . . . . . | Intermediate. |
| | *Triassic epochs* . . . . . | *Epochs of poverty of production of Generic types in Time.* |
| Palæozoic period. | *Permian epochs* . . . . . | |
| | Carboniferous epochs. . . | Intermediate. |
| | Devonian epochs . . . . | Epoch of maximum development of Palæozoic Generic types. |
| | Silurian epochs . . . . | |

Before the Silurian, and after the *commencement* of the present, no special creations of generic types have as yet been shown to be manifested. In the system of life of which all known creatures living or extinct as yet described, so far as our knowledge extends—and there is a consistency in its co-ordination that suggests the probability of our being acquainted with its extremes,—the creation of the fauna and flora of the oldest Palæozoic epoch would seem to be the primordial, and the appearance of man the closing biological events.

When the assemblage of characteristic Neozoic groups or genera is contrasted with that of the Palæozoic, there we find that the concentration of a maximum development of generic types towards the earlier stages of the one and the later of the other great period, includes something more than a mere numerical profusion of generic ideas. The two great manifestations of creative intensity are in opposition, or contrast, and respectively substitute each other; groups that are parallel within their sub-kingdoms or classes, taking the place of each other and playing a corresponding part in the economy of nature. This replacement does not depend on the substitution of a group of higher organization during the latter epoch, for one of lower during the former. Where there is such a substitution it must be regarded as an accident; for the rule is not general, nor can it be held good except for a few instances.

After citing a few leading examples of the substitution of group for group during the contrasting epochs, the lecturer went on to say, from all these considerations, the numbers of species in a group or genus at any given epoch is to be excluded, not being an element in the discussion of the question, though apt to be introduced through mistake of the nature of the generalization attempted to be attained.

There may appear to be a contradiction involved in the expression, *manifestation of polarity in time*, for since time implies

sequence or progression in one direction only, how can we connect with time an arrangement that involves the notion of progression in opposite directions, proceeding from a median zero?

But time is an attribute with which man's mind invests creation; a mode of regarding Divine ideas, necessary for the conception of time by our limited faculties and forming in itself no part or essence of the Divine scheme of organized nature. We speak of Polarity in Time, for want of a better phrase: but this polarity, or arrangement in opposite directions with a development of intensity towards the extremes of each, is itself, if I am right in my speculations, an attribute or regulating law of the divinely originating scheme of creation, therefore, strictly speaking, independent of the notion of time, though perceptible by our minds only in connection with it.

In venturing on a speculation of this kind I am aware that it is subject to much misrepresentation and liable to be misunderstood; the more so since the suggestion must precede the demonstration. At present it can scarcely be received as more than a suggestion; one put forth as worthy of consideration. But in issuing it I do so keeping in view a vast number of individual facts and base it upon the results of investigations of no small extent. To lay these before the scientific world in detail and tabulated shape will be the work of more leisure than can at present be given to the task. In the hope of acquiring fresh data for this investigation I, rashly as some may think, make public this hypothesis. That it is the only one of its class which holds out a prospect of eliminating the germs of truth contained in the conflicting theories at present more or less in vogue, and the only one with which the presence of species of any group of organized beings at any geological epoch will not disagree, are surely considerations that should secure for it a friendly reception. If it be true, as I believe it to be, then the truth that it contains is most important; if it prove in the end to be a misinterpretation, it will at least have served the good purpose of stimulating inquiry in a fresh direction.

## ON PRESERVING THE SENSITIVENESS OF COLLODION PLATES.

BY J. SPILLER AND W. CROOKES.*

The object of our former paper in the *Philosophical Magazine* for May was to draw attention to the principle of preserving the collodion surface moist by taking advantage of the deliquescent character of certain bodies; and we preferred that method of communicating our discovery, as, although theoretically correct, it was not sufficiently developed to warrant our laying it before practical photographers, but required further experiments by which the comparative merits of the different substances at our disposal could be determined.

Having decided against the use of nitrate of zinc, we tried other substances, and among the rest the acetate of potash; but although by its use we succeeded in obtaining very good results, yet the sparing solubility of acetate of silver necessitates so many precautions, that we determined if possible to find an equally efficacious salt among the nitrates.

On giving the nitrate of magnesia a further trial, under circumstances which later experience had shown to be necessary, our former difficulties vanished, and we are now enabled to communicate to the Society the following process, which, in our opinion, scarcely admits of an improvement.

The plate coated with collodion in the usual manner is to be rendered sensitive in a 30-grain nitrate of silver bath, in which it should remain rather longer than is generally considered necessary (about five minutes); it must then be slightly drained and immersed in a second bath, consisting of—

| | |
|---|---|
| Nitrate of magnesia . | 4 ounces. |
| Nitrate of silver . . | 12 grains. |
| Glacial acetic acid . . | 1 drachm. |
| Water . . . . . . | 12 ounces. |

and there left for about five minutes, then removed and placed in a vertical position on blotting-paper, until all the surface-moisture has drained off and been absorbed; this generally takes about half an hour, and they may then be packed away in any convenient box until required for use.

Not only is the sensitiveness unimpaired by this treatment, but we think, on the contrary, that it is slightly increased; instantaneous negatives have been taken on plates which had been prepared some days previously. We are not yet in a position to give the length of time that may elapse between the preparation of the plate and development of the picture; such experiments necessarily require a more lengthened period than we have at present been able to give, but as long as they have yet been kept (upwards of three weeks), there has been no appearance of deterioration.

Before the development, we find it advisable to moisten the collodion film by immersion in the silver-bath for about half a minute, as otherwise the pyrogallic acid or

* From the Journal of the Photographic Society.

iron solution would not flow evenly over the plate. The fixing, &c., is of course conducted as usual.

It will be as well to draw attention to a few points which, although not absolutely essential, may possibly be found useful in practice. The glass plates should be cleaned with more care than is necessary when they are to be used immediately; we have found strong nitric acid applied with a tooth-brush most convenient. With regard to the collodion, we have tried very many different samples, and with tolerably uniform success. The greater number of our experiments have been made with a tolerably thick collodion, the alcohol and æther of which were in the proportion of 1 : 2, made sensitive with four grains of iodide and half a grain of bromide of ammonium to the fluid ounce. We have also employed a collodion containing iodide and bromide of cadmium with good success.

Of the 30-grain silver solution for exciting the plate we have only to recommend the use of acetic instead of nitric acid, to give the bath that faintly acid reaction which is by some operators considered desirable.

There are one or two circumstances to be attended to in the preparation of the magnesia-bath. Commercial fused nitrate of magnesia is very liable to contain chlorine, and also to have an alkaline reaction on account of the fusion being carried too far. Of course the quantities of acetic acid and nitrate of silver given in the formula for the bath are on the supposition that the nitrate of magnesia is pure; if this be not the case, it should be rendered perfectly neutral with acetic acid, the chlorine exactly precipitated with nitrate of silver, and then the proper amounts of acid and silver added. However, if the impurities are very considerable, it will be safer to reject the salt at once. This bath will keep in good order for a long time; the only point to be attended to is to drain the plates slightly after coming from the silver-bath, and, if necessary, to remove the liquid from the back with blotting-paper, so as to introduce as little silver as possible into the nitrate of magnesia. A solution of one grain of silver to the ounce is quite sufficient to keep the plates sensitive; and when the strength rises, as it will in time, to above a certain limit, the slight evaporation that always takes place will render the silver solution sufficiently strong to dissolve off the iodide in small holes. If this occur the bath can be restored by nearly, but not quite, precipitating the silver with a solution of chloride of magnesium, and then filtering.

One of the most important things to be attended to is the necessity of preserving the plates where they are perfectly free from any light. It will be evident to all, that anything short of absolute darkness, when the sensitive surface is exposed to its action for day after day, and perhaps week after week, must be fatal to its subsequent cleanliness. The necessity for protecting the plates from any deleterious gases, ammonia, for instance, is too obvious to require comment.

## MARINE LIFE PRESERVERS.

BY CAPTAIN TREMBLAY.*

The writer proposes to place on board of every vessel a life-preserver, by means of which the last resource of a shipwrecked crew, that of effecting a communication with the shore, may be provided for, just as the life-buoys already employed furnish a last resource to a sailor who falls into the sea.

The apparatus which the writer has invented for obtaining this end, and which he denominates "*caisse de sauvetage*," is constructed so as to project a cord, furnished with a grapnel, to a distance; it carries with it all that is necessary for the purpose,—motive power, cord, carriage, and appendages.

The military fusee is employed as the motive power, but the shell which is ordinarily carried at the head of this projectile is replaced by iron hooks, and a wooden head of a pointed form. This head is pierced with a central hole in the direction of its axis, into which what written instructions it may be desirable to send from the vessel to the shore, or from the shore to the vessel, are to be placed. The fusee is directed by a rod, to which is attached an iron chain that receives the cord. The end of the cord is covered with leather for about two yards of its length, in order to protect it from the fire. The fusee is thus converted into a strong mooring grapnel, capable of supporting, throughout its length, a strain nearly equal to a ton. The holes by which the inflamed gases escape, as well as that intended to receive the rod, are threaded at their lower parts, and stopped by metal threaded stoppers, which are screwed into them. These stoppers have a double effect: they facilitate the projection of the instrument, and render the grapnel secure from injury by fire or damp.

The cord is wound in coils round a wooden shaft, which is afterwards withdrawn, leaving a cavity, in which the rods of the grapnel are placed. The unwinding commences at the central coil, and the cord passes through a hole of the same diameter

* Read before the Society of Encouragement, Paris.

as itself, provided for that purpose in the outer partition of the case.

The resistance sustained by a cord of about half an inch in diameter has been shown, by experiments made at Toulon, to amount to about 32 cwt.; we might therefore easily give to such a cord a resistance of 20 cwt.

The elevation at which the projectile must be discharged is obtained from a double quadrant of a circle traced on one side of the case. On the same side are placed two rods for determining the horizontal direction in which it must be placed; and on the cover is fitted a trough, the two sides of which are moveable and turn down; this trough serves as a carriage for the grapnel.

When the instrument is projected from a ship to the shore, the grapnel, sinking deep into the mud or sand, or catching against the inequalities of the soil, securely connects the cord to the shore. The force of projection is, in this case, augmented by the power of the wind, against which the crew have vainly contended.

When cast from the shore to a ship the grapnel will catch in the rigging of the vessel, the apparatus being projected against the wind.

This apparatus, placed on board of each vessel, will not only serve to establish a communication with the shore, but may also be employed in the following cases:—1. To communicate with a vessel, which, on account of the violence of the sea, cannot be approached; we should not be again compelled to witness one vessel unable to succour another in distress, because of danger to itself. 2. To throw a tow-rope to a vessel, an operation not always easy at present. 3. To save a sailor who may have fallen into the sea, when he would otherwise have to be abandoned on account of the roughness of the weather. A very simple modification of life-buoys would, in conjunction with this instrument, effect the latter object. The seaman who falls into the sea when the vessel is under sail knows that the life-buoys will be flung out to him, and that he will only have to cling to one of them until a boat is lowered and comes to pick him up; but he knows also that if the wind is very violent, and the sea is running high, he cannot be saved: it is a sad necessity, but one which happily can now be avoided. These are the means which the author proposes:

Let us imagine that the two life-buoys, which are suspended to the stern of the vessel, are connected by means of a cord slung over each of them, and the extremities of which are attached to their stocks. Let us suppose that we release these buoys, thus arranged, when a sailor falls overboard, and that he lays hold of one of them; he will then unwind the coils of cord attached to the buoy, which naturally drops astern, and can himself separate the two buoys sufficiently far to afford those on board the vessel an opportunity of aiming the grapnel between them, so that it may catch on the cord which unites them; it will then only be necessary for those on board to haul in the grapnel line, and thus save the seaman, without risking the lives of those who are anxious to rescue him.

In order to convince all of the utility and importance of this apparatus, it will be sufficient to let facts speak for themselves. The writer contents himself with citing the shipwrecks of the men of war, *la Truite*, *le Superbe*, *le Rhône*, *la Marne*, *le Papin*, *le Caraïbe*, *l'Alcmène*, &c., and the more recent loss of the French brig *le Précurseur*, which, in October, 1852, went on shore a short distance from Havre pier.

The author concludes this note by expressing his desire that all societies for preserving life from shipwreck, and the captains of the royal and mercantile navies of all nations, may follow the example shown them by the Society of Boulogne and the commanders of His Majesty's yachts, and apply to the Minister of Marine for an apparatus so simple and effective, in commending which a great number of naval and artillery officers concur.

## ACTION FOR INJURY SUSTAINED IN A COTTON-MILL.

*Lancaster, August* 8.

PEEL *v.* GREENWOOD.

*Nisi Prius Court.—(Before Mr. Justice Crowder.)*

THIS was an action brought by the plaintiff to recover compensation in damages for the loss of a hand by the defendant's machinery, which the plaintiff alleged was not boxed off with reasonable care to render it safe to the work-people employed about it, and that he lost his hand in consequence. The defendants pleaded the general issue.

Mr. James, Q.C., and Mr. Cowling appeared for the plaintiff, and Mr. Serjeant Wilkins and Mr. Monk for the defendants.

It appeared that the plaintiff, Ellis Peel, was a workman employed by Messrs. Greenwood and Co., who are the owners of a cotton-mill near Colne, as an engine-tender, at 15*s.* a-week wages, and that a part of his duty was to oil the machinery of the mill. A main shaft from the engine turned a number of drums and machinery, and by means of cogwheels a cross shaft was made to turn other machinery. It was part of the plaintiff's duty to oil these cogwheels in the

sockets. Formerly this had been done while the engine was at rest, during the breakfast-time of the work-people, but it was alleged by the plaintiff that one of the defendants said the oil was wasted by this method, and ran over the shaft, and that he insisted on having the wheels oiled while the machinery was in motion. The cogwheels were only partially boxed off, and no ladder was provided to reach the sockets of the wheels, nor any funnel into which to pour the oil. The plaintiff had, as he stated, consequently, to get upon the power-looms and oil the centres of the cogwheels as well as he could, steadying himself by the shaft in motion. While doing this on the 6th of January last, at seven o'clock in the morning, the machinery running, the shaft against which he leant his right arm carried his coat-sleeve up to the cogwheels, into which it got, and his hand was instantly drawn in and nearly crushed off, and it had to be amputated the same day. The plaintiff, who was examined as a witness, said that before the accident he had repeatedly complained that there were no funnels to the sockets of the wheels, so as to enable him to oil them without danger, and that one of the defendants said to him, "Thou must mind as well as thou can, and I will get them in a day or two."

For the defence it was contended that an oil-can fitted to the top of a long stick was provided for the purpose of oiling these wheels, and that when used it was perfectly easy to oil them without any danger, and that they had been so oiled ever since by the plaintiff's successor to his duties; that the accident had occurred through the plaintiff's own foolhardiness and indiscretion while he was trying to clean the cog-wheels when in motion, a duty he ought to have performed when the mill was standing on a holyday, but which he had not then done, in order to take the holyday himself. It was also proved that since the accident the defendants had offered the plaintiff 6*s.* a-week to do what he could about the mill, and had paid his doctor's bill, amounting to five guineas.

At the close of the plaintiff's case, Mr. Serjeant Wilkins objected that there was no evidence to go to the jury.

His Lordship, referring to the recent case of "Patterson *v.* Wallace" in the House of Lords, which decided that it was the duty of an employer to take all reasonable care to box off his machinery, thought there was evidence to go to the jury, but he would give leave to the defendants to move to enter a nonsuit.

His Lordship having summed up,

The jury retired, and, after a long absence, found a verdict for the defendants.—*Times.*

## STEAM FIRE-ENGINES.

We have before had occasion to complain of the readiness with which the *Times* gives publicity to articles containing foolish, and often erroneous statements concerning mechanical subjects, especially when by so doing they can add to the honour of the Americans, while diminishing the merit of our own countrymen.

In May last, another example of this illiberal spirit appeared in a paper on the "Cincinnati Fire-engine;" and again, more recently, it has recurred to the same subject, characterizing the engine as something novel, and borrowing particulars from "Dilke's New York Exhibition Report." The importance to be attached to such articles will be properly estimated when we remind our readers that a steam fire-engine was invented by Mr. John Braithwaite, and described in the *Mechanics' Magazine* upwards of *twenty-four* years ago—(see vol. xii., p. 434.) The description there published was prefaced by the following observations:

"Shortly after the conflagration broke out, to which the Argyle-rooms fell a prey on Friday last, a new fire-engine, worked by steam, on the same principle as the 'Novelty' steam carriage, and manufactured by the same ingenious and enterprising engineer (Mr. John Braithwaite), made its appearance on the scene, under the direction of Mr. Alfred Braithwaite, and earned for itself universal admiration, by the powerful services which it rendered on the occasion. It was worked incessantly for nearly five hours: discharged upon the burning pile and adjacent buildings from thirty to forty tons of water per hour: and sent its jet of water completely over the dome of the building, a height of at least eighty feet. We have seen it stated in some of the newspapers that none of the engines were able to reach the dome; but this statement can only be correct as regards the old engines. Several gentlemen who were present at the fire have assured us that they saw distinctly the water ejected from Mr. Braithwaite's engine quite over the dome; and one of the same individuals previously witnessed a private trial of the engine, when it threw water over a pole ninety feet high, erected for the purpose of the experiment. The expenditure of fuel to produce these wonderful effects was only about three bushels during the whole five hours: and the help of *two*

men only sufficed to keep the steam up and superintend the working of the engine.

"The strong interest which the performances of this new fire-engine have excited, has induced us to lose no time in making ourselves acquainted with the details of its construction; and it is with much pleasure we are thus early enabled to present our readers with the very correct engraving on the preceding page, and the following descriptive particulars."

Since the above was written, further experience has amply confirmed the efficiency of Mr. Braithwaite's engines, which have been employed with entire success in London, Liverpool, Berlin, &c. With such facts as these extant, and well known among scientific men, to write of the *novelty* of steam fire-engines is both unjust and ridiculous.

## USES OF STEATITE OR SOAPSTONE.

Having recently alluded to the new employment of the above-named material for building purposes, we have no doubt but it will interest many of our readers to know something more of the other purposes for which it has been employed for a number of years.

Steatite, or to call it by its more familiar name—*soapstone*, is a kind of soapy marl, or talc, sometimes white, at others, green, or gray, and more rarely red or yellow. It is composed of silex, alumina, magnesia, oxyde of iron, and water, but it varies in different localities. As it requires a very high heat for fusion, and is cut or wrought with great facility, very good crucibles can be made of it, which fire hardens and litharge penetrates very easily. It is employed for moulds in metallic castings. It is used in England in the manufacture of porcelain. It has been made into cameos, to which has been given a fine brilliancy by heat, and such a degree of hardness as to give sparks, with steel. Having a great affinity for glass, steatite, reduced to very fine powder, answers very well when mixed with other colours for painting on glass. It is used also as a kind of sympathetic pencil for writing on glass, leaving no traces when the glass is rubbed with woollen cloth, but becoming again visible by breathing freely upon it, and disappearing again as the glass becomes dry. Workers and embroiderers of silk prefer it to chalk for tracing, because it is more durable and does not affect the colours of the stuff. As steatite has the property of uniting with oils and fatty substances, it enters principally into the composition of the balls used for cleaning silk and woollen stuffs. It is the basis also of some pigments. It gives a fine brilliancy to marble, to serpentine and gypseous stones. Mixed with oil, it is used to polish glass and metallic mirrors. If newly prepared leather be powdered with it and allowed to dry, it gives it, when rubbed with horn, a very fine lustre. Steatite is employed for glazing paper, by being spread over it in very fine powder, or better by being mixed with the colouring matter, and then glazing by rubbing with a brush. The powder of steatite, from its unctuosity, is one of the substances which gives the easiest play to vices and screws, and diminishes friction in wheels. Mixed with tallow it furnishes a very favourable material for preserving machinery.

Steatite is easily cut with a saw, turned in a lathe, and smoothed with a plane. It may, therefore, be worked into any shape, and afterwards if necessary be rendered very hard. When the artist has finished his design he places it in a covered crucible, surrounds the crucible with charcoal in a furnace, raises the heat gradually, keeps it for two or three hours in nearly a white heat, and allows it to cool slowly. When it comes out, it is very hard.

Some specimens of steatite acquire a milk-white appearance by exposure to heat; those which are coloured assume a gray or reddish tint, but they may be variously coloured by the aid of oily, alcoholic acid or alkaline solutions. Colours that dissolve in amber, varnish, such as verdigris, ochre, &c., colour steatite, when heated by charcoal. Colours dissolved in spirits of turpentine are the most lively. Solutions of carthamus (saffron flower), gamboge, campeachy wood, dragon's blood, &c., in spirits of wine, colour steatite by steeping it in them several hours. Solution of gold in aqua regia, gives a purple colour, of a shade depending on its strength. Muriate of silver colours it black when aided by sulphuric acid, sulphate of indigo—a grayish blue. If steatites, coloured by nitro-muriate of gold, or muriate of silver, be exposed to a bright flame, it assumes the metallic colour of gold or silver.

When the stone is heated, colours dissolved in acids are rapidly and finely attached to it, and hence a cameo ground, of any particular colour, is easily obtained.

When the stone is baked, it is polished, as usual, with emery, tripoli, or tin putty. It acquires much brilliancy, resembling agate, jasper, calcedony, &c. It is easy from these facts to infer, that the engraver may avail himself of this substance, on account of its softness, since he may perform upon it one day as much as he could do

upon hard stones in a week; and when it has passed through the fire, his work acquires a hardness and durability almost unlimited.—*Scientific American.*

## A LAKE PHENOMENON.

The *Niagara Mail* gives the following description of a remarkable phenomenon which occurred on the 25th of April last at the head of Lake Ontario, near the mouth of the Niagara river:

About a quarter or half-past six o'clock, P.M., a thunder-storm came up from the north-west, with a few flashes of lightning, and a heavy shower, accompanied by a strong squall of wind for a few minutes, the weather being quite calm just before the gust, and the same after it. The fishermen who were on the beach, seeing the squall come on, hurried to get in their seine, when suddenly there appeared, rolling in upon them, an immense wave from the north-west. The height of this wave could not have been less, we judge, than from six to eight feet, although it is difficult to ascertain correctly. It came rolling on the smooth lake with great velocity, carrying all before it, and sweeping some of the fishermen into the Two-mile Pond, and dashing others of them high up against the bank, by which, as we related, two persons were unfortunately drowned. The water came and returned three times in succession, and then settled down quite calm, as it had been before this commotion. It was noticed, moreover, that the wave brought up and cast upon the beach a quantity of logs and sunken driftwood, which had apparently lain long at the bottom of the lake, showing clearly that the movement must have come from the bottom. There was no wind blowing to cause such an unprecedented and rapid swell of the water, the like of which had never been seen on this side of the lake, although something similar occurred at Cobourg some couple of years ago, and a similar phenomenon is related as having taken place in Mud Lake within a few years.

It is evident to us that there has been an earthquake in the bed of the Lake, at no great distance from land, although there was not the slightest tremor noticed on shore. These occurrences, taking place as they do, would seem to indicate that the bed of the Lake is nearer the seat of subterranean disturbance than the main land, and may undergo agitation at times without the fact being noticed by dwellers on its margin; but when the earthquake was felt here about eighteen months ago, the rush of waves upon the shore for a short time was tremendous. But the disturbance in that case being, in all probability, further off, prevented a great and sudden rise of water like that on the 25th.

It has been shown, in support of a certain theory, that by far the greatest number of earthquakes have occurred about the new or full of the moon. This theory may receive another case in its support, by the consideration that the event above recorded took place within thirty-one hours of the new moon. We leave the matter as one worthy of philosophical consideration.

## RAILWAY EXPLOSIVE-SIGNALS.

Captain Norton has recently effected improvements in his railway explosive-signals, and now discharges them from an ordinary dragoon's pistol. The guard of a train, when he wishes to communicate with the driver of the engine, has nothing more to do than place the pistol in a directing-tube attached to the carriage, and adjusted to the required elevation, according to the length of the train; the arrow or bolt will always fall about fifty yards in front of the driver of the engine, and warn him by *four* signals,—the flash, the report, the cloud of smoke, and the fire-ball, which last will burn on the road, with a brilliant flame that cannot be extinguished for more than a minute.

## EXPERIMENTAL MODE OF DETERMINING THE HEIGHT OF A MOUNTAIN.

*To the Editor of the Mechanics' Magazine.*

Sir,—I venture to offer the following solution of "Inquirer's" problem for your approval. The time of oscillation of a pendulum at the summit of a mountain varies from that of the same pendulum at its base because the force of gravity acts with less intensity at the first than at the second position. And the *amount* of variation in the time depends in a known way on the change in the earth's attracting power; and the amount of variation of this attraction depends also in a known way on the excess of the distance of the summit from the centre of the earth above the distance of the base from the same point. Thus, from two experiments with the pendulum, we can discover the difference of the heights at which they are made.

Suppose $t$ and $t'$ to be the two observed times, the first for the base, the second for the summit of the mountain; $g$ and $g'$ the corresponding values of the accelerating force of gravity; $x$ the height of the moun-

tain; R the distance of the base of the mountain from the centre of the earth.

Then, since the accelerating force of gravity varies inversely as the square of the distance from the centre, we have

$$\frac{g}{g'}=\frac{(R+x)^2}{R^2} \quad . \quad . \ (I.)$$

Again; the general expression for the time of oscillation of a pendulum is

$$\pi\sqrt{\frac{h^2+k^2}{gh}},$$

where $h$ is the distance of the point of suspension from the centre of gravity, and $k$ is the radius of gyration.

Hence,

$$t=\pi\sqrt{\frac{h^2+k^2}{gh}},$$

$$t'=\pi\sqrt{\frac{h^2+k^2}{g'h}};$$

$$\text{or,} \quad \frac{t'}{t}=\frac{\sqrt{g}}{\sqrt{g'}} \quad . \quad . \quad . \ (II.)$$

Now, from (I.)

$$\frac{\sqrt{g}}{\sqrt{g'}}=\frac{R+x}{R}.$$

And from (II.)

$$\frac{R+x}{R}=\frac{t'}{t};$$

$$\therefore \quad x=R\left(\frac{t'}{t}-1\right)$$

$$x=R.\frac{t'-t}{t}.$$

To illustrate this, let us suppose the pendulum to beat seconds at the base, and to make 3,599 oscillations per hour at the summit of the mountain. Then assuming the radius to be 4,000 miles, the height of the mountain in miles would be, since

$$\left(t'=\frac{3600}{3599} \text{ and } t=1\right),$$

$$4000\left\{\frac{3600}{3599}-1\right\}$$

$$\frac{4000}{3599} \text{ miles};$$

or 5,868 feet nearly.

I am, Sir, yours, &c.,

J. C.

Deptford, Aug. 5, 1854.

## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I cannot agree with "A Mechanic" in his observations on the work done by the propellers of ships, as contained in No. 1613 of the *Mechanics' Magazine.*

"A Mechanic" takes the case of a paddle-wheel, and says that if R represent the resistance on the bows, $v$ the velocity of the ship, and $v'$ the velocity which the propeller has in relation to the fluid, the work expended to produce the effect of propulsion is $R(v+v')$.

Now, whether the velocity $v'$ be considered as having no share in the propulsion of the ship; or whether it be supposed essential to propulsion, the quantity $Rv'$, which "A Mechanic" represents as power lost, must remain entirely out of the question. In the former case, as a matter of course, and in the latter case because the equation $Rv=R(v+v')$, which must obtain when there is equality between the work done by the propeller, and the work done by the resistance, becomes impossible. If $v'$ has no part in the propulsion of the ship, I do not understand how $Rv'$ can express a loss of power, R being the resistance of the ship at the velocity $v$.

The excess of velocity $v'$ represents what is generally called the slip; and, according to "A Mechanic's" supposition, we might imagine a steam tug taking in tow one vessel after another, until it could but just proceed with its load; when the great excess of the velocity of the propeller over the speed of the ship would prove that the whole power of the engine was all but lost!

I should have thought that the propeller was the agent through which the power of the engine is made available for propulsion, and that the velocity V or $(v+v')$ of the propelling area, and the work done by the engine, were regulated by the resistance to be overcome at a given speed of the ship.

Not only do the ascertained facts, so far as I am acquainted with them, not bear out the assertion that a loss of power arises from the obliquity of the blades; but they prove, moreover, in the most unmistakable manner, that the excess of velocity of the propeller area (generally called the "slip") does not indicate a corresponding loss of power at all, in either kind of propeller. Whence it is to be inferred that either the facts are, or that the theory is at fault. It is also to be observed that the same definition of "slip" does not apply to both the paddle-wheel and the screw-propeller.

I am, Sir, yours, &c.,

Y.

August 3, 1854.

## FIRMIN'S PATENT IMPROVED ANCHORS.

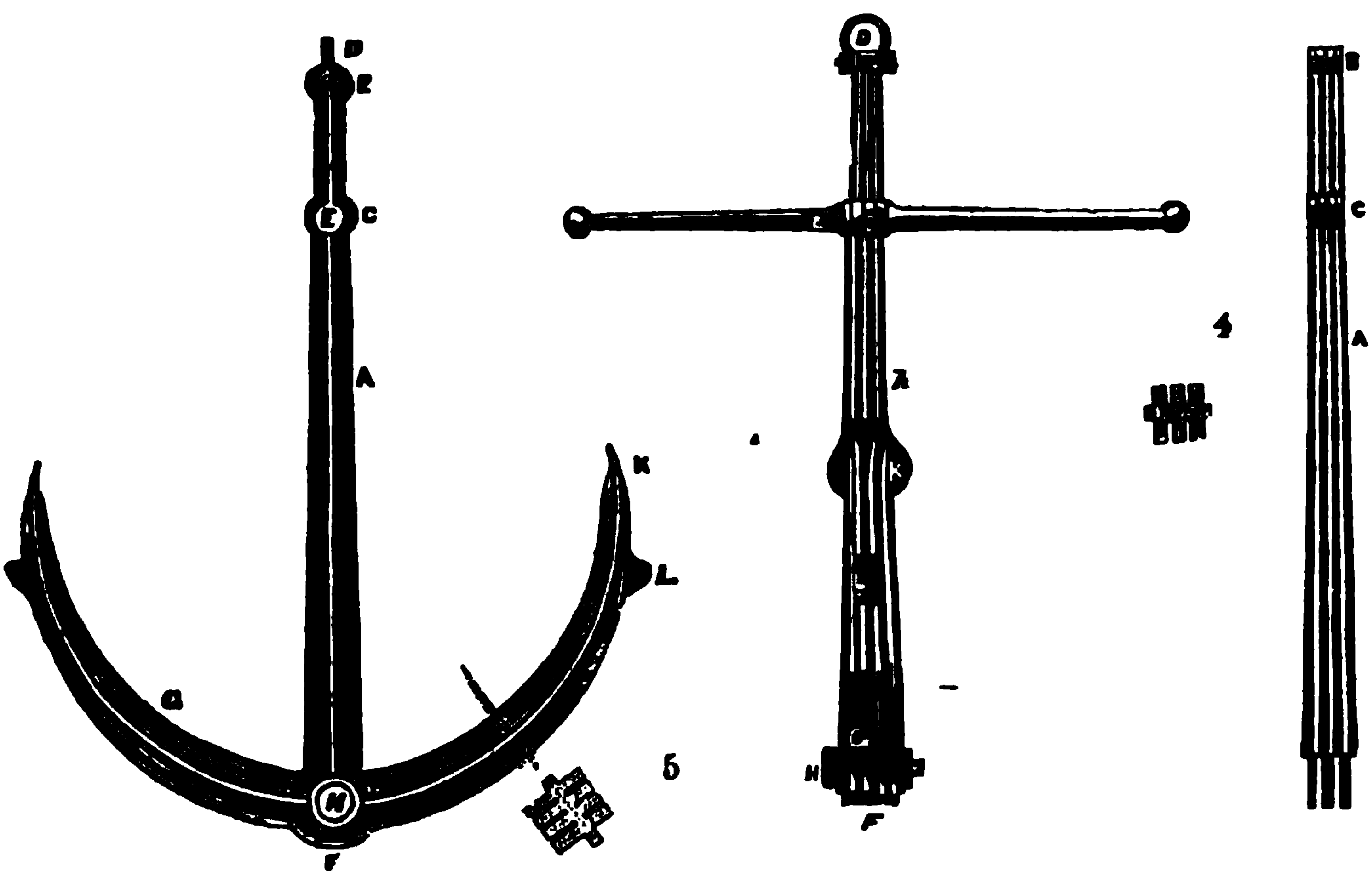
(Patent dated January 26, 1854.)

Mr. Firmin, of Bath, has recently patented an entirely new method of constructing anchors, his object being to reduce their cost by disposing the material of which they are formed in such manner as to produce, with a given quantity of metal, a strength equal to that of an ordinary anchor of much greater weight; and also to increase their portability by making them in separate pieces, which may be combined or taken apart at pleasure.

He forms both the shaft and arms, or either, by combining several ribs or plates so as to leave cells or open spaces between them, or by first forging those parts solid, and afterwards cutting grooves out of them by rolling, forging, or any other means.

Fig. 1 of the accompanying engravings

Fig. 1. Fig. 2. Fig. 3.



represents an anchor with moveable palms, constructed according to Mr. Firmin's invention. Fig. 2 an end elevation of the same, and fig. 3 a view of the shaft detached from the palms and arms. A A is the shaft or shank, which is forged of the cellular shape represented by the section in fig. 4, with the bosses B and C solid, for the purpose of having holes drilled through their centres for the reception of the ring-bolt, D, and stock, E. The lower end of the shank is also forged solid, and afterwards slotted out in the manner shown, and drilled, in order that it may be fitted into corresponding recesses or slots cut through the crown part, F, of the arms, G G, where it is secured by a strong bolt, H, upon which the shaft is free to turn as upon a centre. He sometimes forms the shaft of two, three or more plates of iron, rolled with or without a rib on each side, except at the parts, B and C, and the lower end, which are left of an increased thickness. He forms the shaft and arms of T-iron, or of angle-iron, or of a combination of these, firmly riveted, welded, or bolted together. G G are the arms, formed also cellular, as indicated by the section in fig. 5, taken through the arm at *a a*, by either forging them out of the solid, or by welding, riveting, or bolting plates of angle or T-iron, or plates rolled with a rib on each side. K K are the flukes, which are formed separately, and then welded or otherwise firmly secured to the arms. L L are the spurs, which are also forged separately and welded to the arms.

## GRIFFITHS' TREATISE ON NAVAL ARCHITECTURE.

In vol. liv. we had occasion to publish a critique on the above work, which had been most unduly extolled by the New York press. The nature of the treatise was such as to render it advisable that our assaults upon the author's statements and speculations should be accompanied with accurate investigations of the principles upon which the science of naval architecture is really based, and in conformity with which all

attempts at improvement must be conducted. By following that course we hoped to compensate American ship-builders for any loss they might have sustained by the overthrow of their voluntary champion, and to confer upon them the means of hereafter delivering themselves from the discredit of placing any reliance upon a book which is, to say the least, a great disgrace to them. Whether our hopes on the subject have been realised to any considerable extent we do not know; but we have recently discovered that the individual who certainly might have studied our remarks with immense advantage, has apparently profited but little by them.

In a second edition of his book Mr. Griffiths has put forth what is intended, we suppose, as a *refutation* of our arguments in the paper before referred to. It runs as follows:

"The preaching of Paul at Ephesus scarcely produced a greater sensation among the idolatrous Ephesians than did the yacht *America* among the sporting circles of the Old World. American ship-builders have ventured to look beyond the battlements of war for perfected models in the messengers of peace; nor has their vision been confined to the *studio* of the philosopher, who would bend the channels of commerce into his untried theory, and hinge the science of ship-building on the solution of a single problem; much less are they willing to commit the interests of this important art in the United States to the dictation of the periodical press of England, even though it be mantled with the guise of mechanism. And although the ship-builders of the United States may have been deemed refractory by the philosophers of the Old World, yet we trust that it will be regarded as a sufficient apology (when told that the United States are young as a nation, and, consequently, her experience must of necessity be limited), that their vessels, whether *sailing or steaming*, have *no* superiors, and that it would perhaps be quite as well to continue the consultation of the same chart which has pointed unmistakably to the channel of *success*, and which to them, and to the mechanical world, is sufficiently legible, even though it may not seem quite clear to a small portion of the Transatlantic press. They, however, have had a sufficient amount of experience and research to enable them to discover that the man who knows so little of the *practical* operations of a shipyard, as to be unable to tell how many sixteenths of an inch are contained in one foot of an ordinary mechanic's twelve-inch rule, has gone beyond his depth when *he* undertakes a crusade against American shipbuilders. We are frank to admit that they have not followed the metaphysical abstractions of their ancestors, and that they are unwilling to endorse the adage, which teaches that 'Britannia rules the waves;' and however little they may know of the theories of ancient or modern philosophers, or even of the researches of the renowned hero of a LONDON MECHANICAL MAGAZINE, they know that no sophistry can make that right which *common sense* pronounces wrong; and they have learnt still more that the best theory is that which is proved by practice, and can point to their ships as the best evidence *they* are able to furnish the world that their theory and practice agree to demonstrate the correctness of their works on marine and naval architecture; and that the principles upon which their practice is based will live when the invective gall of an editor, or the fury of their jealous neighbours, has passed away—'Time's boundary sundered, and commercial operations come to an end.'"

Whether such a reply as this to a careful and, as we still believe, an instructive and highly necessary criticism, is an honour or a shame to Americans, we leave our readers to judge.

As Mr. Griffiths has, however, displayed so much violence in his rejoinder, we will complete his disgrace by quoting the following conclusion to his treatise:

"When we contemplate the various gradations of progress in the art of ship building, the variety of phases presented to the mind of him who studies its history, we can hardly fail to admire the beauties of this important branch of commercial art. If we go back to the time when the Sandwich Islander plunged beneath the briny wave astride the round-edged plank, and contrast *his* knowledge of the laws of flotation with *our own*;* if we measure the knowledge of the art as developed in the bark canoe, decked with the skin of beasts, pourtraying the altitude of the art in savage life, or following the scintillations of light flashing athwart the mechanical horizon of a barbarous age, and contrast the coracle of Britain with her ships of the present time; if we press our inquiries still farther, and roll back *Time's* progressive car, dissolving two thousand years of the past in the crucible of history, and in that time-honoured era freight the car of the destroyer with the Tyrian shallop that carried tin from Britain; speed on the wheels of progress with the precious relic, until she floats upon the Atlantic's tumultuous tide beside those engaged in the same trade at the present day; we may go farther, and continue our researches, by fathoming every step of the

* We trust, for the sake of the author's rhetoric, that he uses these words in no very restricted sense.

world's advancement through the vista of time down to the latest now, and we shall discover that the progress of this commercial art is the index to the *world's* history; and whether developed in the plank, the raft, or the canoe, the junk of the Chinaman, the shallop of the Phœnician, or the galley of the Carthagenian, they alike proclaim this universal truth. The coracle of Britain, the bark of the Dane, or the carrack of the Portuguese, alike impel the march of civilization in the exhibition of the progress of mechanism as developed in this excelling art. The Dutch galliot, the Spanish galloon, and the Venetian gondola, each in their turn, served to give light and motion to civilization. The polacca of the Levant, the ship of Great Britain, and the schooner (*yacht*) of *America*, have all contributed to quicken the impulses of humanity, to extend the boundaries of civilized life, and to exhibit the glories of mechanism in the scientific construction of this stupendous fabric."

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Bellford, Auguste Edouard Loradoux, of Castle-street, London. *Improvements in machinery for bending metal and producing forms thereon by pressure.* (A communication.) Patent dated January 23, 1854. (No. 168.)

This invention mainly relates to methods of bending the edges of sheets, and "consists in a certain arrangement of bending or forming dies for giving the desired forms of holding apparatus for holding the articles to be operated upon, and of apparatus for causing the articles to be presented properly to the dies; also in certain arrangements of mechanism for giving the necessary movements to the said parts."

Brooman, Richard Archibald, of Fleet-street, London, patent agent. *Improvements in machinery for sawing stone and marble.* Patent dated January 23, 1854. (No. 171.)

This invention consists in giving the feed lift to the saw-frame at or sufficiently near the centre of the reciprocating stroke, or at equidistant points from the centre, for the purpose of effecting the freer percolation or introduction of sand or other gritty material and matter:—in repeating the feed-lift of the saw blades by means of two or more double-inclined planes or projections, or their equivalents at each stroke:—in interposing India-rubber or other elastic medium between the iron ways and the double-inclined planes or projections which lift the saw-frame to absorb or reduce the effects of concussion:—in giving a proportionate feed by means of adjustable friction palls in connection with an adjustable eccentric; and in guiding the saw-frame by means of eccentric pins for the purpose of preventing lateral motion in the same without injuring the guide-posts.

Brooman, Richard Archibald, of Fleet-street, London, patent agent. *Improvements in extracting copper from the ore.* Patent dated January 23, 1854. (No. 172.)

*Claim.*—Extracting copper from copper ores, by mixing ammonia with the ores after they have been crushed, by agitating the mass, and by introducing a current or currents of air therein.

Sleigh, Adderley Willcocks, of Weymouth-street, Portland-place, Middlesex. *Creating a continual self-acting self-sustaining new motive power, applicable to every purpose requiring speed, motion and power, together or separately.* Patent dated January 24, 1854. (No. 174.)

We must leave our readers to attempt, as we have attempted, to discover what Mr. Sleigh's invention probably consists in, from the circumstance that he first enumerates what he denominates "five natural laws"—of which the first, (which we give as a specimen,) is, "the principle of the imponderosity or identification of lesser quantities or bodies of fluids or liquids, in fluids or liquids of their own nature or otherwise, and of the same or different temperatures;" and then adds, as a description of the main feature of his invention, the following:—"The application of the principle of original or additional motive power acquired or created by the action and operation of a consecutive juxta hydrostatic valve or valves, accomplishing the atomical displacement of liquids within its or their limits of action, thus throwing an effective preponderance of alternate or continual hydrostatic pressure or weight on any required side or sides of a chamber, cylinder, closed vessel, or valve, and acting either independently of the five herein mentioned foregoing principles or natural laws, or in union with them, as carried out by the employment of the following or similar mechanical agency as a continual motive power."

Ridgway, John, of Cauldon-place, Stafford, china manufacturer. *Certain improvements in the method of generating and applying heat to kilns, ovens, and furnaces, for manufacturing purposes.* Patent dated January 24, 1854. (No. 178.)

*Claims.*—1. An arrangement of flues in connection with a central furnace, furnished with dampers and regulators, for the purpose of directing the heat to any part of the kiln and retaining it there. 2. The employment of a valve at the top of the kiln in

connection with central tubes, flues, and regulators. 3. The employment of upward and downward currents of air, either alternately or simultaneously. 4. A certain combination of central fires and flues.

MASSEY, WILLIAM, of Hemer-terrace, Bootle-cum-Linacre, near Liverpool, Lancaster, manufacturer of mineral teeth. *Improvements in artificial teeth and gums.* Patent dated January 24, 1854. (No. 180.)

*Claims*—1. Combining or incorporating with colouring or staining matters with mineral substances to form artificial gums. 2. Forming artificial gums of mineral substances, separate from the teeth, and fixing suitable teeth thereto.

BAPTY, JOHN, of Leeds, York, yarn-spinner. *Certain improvements in machinery for preparing to be spun wool and other fibrous substances when mixed with wool.* Patent dated January 24, 1854. (No. 181.)

*Claim.*—The application to wool-carding engines of a certain cylinder and rollers, for the purpose of rolling and condensing the slivers as they pass from the doffing cylinder to the bobbin or spool.

LISTER, SAMUEL CUNLIFFE, of Manningham, Bradford, manufacturer. *Improvements in combing wool, cotton, and other fibrous materials.* Patent dated January 24, 1854. (No. 182.)

This invention consists in giving a to-and-fro motion to a feeding apparatus, so that the ends of the fibrous material being placed by it into the teeth of a passing or other comb, will be, by the recession of the feeding-head, drawn through the teeth of the comb and cleaned from noil and dirt, and so that at the next stroke of the feeding-head the ends of the fibre which had been previously cleaned will be so far laid over, and through the teeth, that nipping instruments may take hold of it and draw it through. The process is continually repeated in order to obtain a sliver.

BIRD, JOHN, manager of Chance's Fire-clay and Brick-works, Oak Farm, Kingswinford, near Dudley. *Improvements in kilns for burning bricks and other articles.* Patent dated January 24, 1854. (No. 183.)

This invention consists in constructing a kiln in the following manner:—"A culvert or air-passage is built below the bottom leading from the external air to the middle of the foundation of the kiln, where a central mass of masonry is built with a space all round, open to the air culvert or passage, and the surrounding foundation is built up to receive and support the bottom or floor of the kiln; but in place of such floor or bottom being built solid on the foundation, numerous radial passages are made, on which the bottom or floor is laid, such passages at their inner ends opening into the central space, with which the air culvert communicates, their outer cuts opening into a hollow lining of the kiln."

WALMSLEY, EDWARD BATTEN, of Middle Mall, Hammersmith, Middlesex, iron-merchant. *Improvements in utensils, implements, and apparatus for the purpose of lighting, heating, and cooking.* Patent dated January 25, 1854. (No. 185.)

The characteristic feature of this invention is, that light or heat is by it to be obtained in an apartment without any diminution or deterioration of the contained atmosphere, combustion being supported by air led in by a pipe from without, and the products of combustion being carried off through another pipe to the external atmosphere.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *An improvement in violins and other similar stringed musical instruments.* (A communication.) Patent dated January 25, 1854. (No. 186.)

This invention consists in the application to violins, violoncellos, bassviols, and other instruments of this description, of a horn or trumpet, "in such manner that the latter shall open into the interior of the violin, by which means the vibrations of the latter are greatly increased, and its tones rendered much more powerful and sonorous."

REID, ARCHIBALD LOCKHART, of Glasgow, Lanark, North Britain, print-cutter. *Improvements in printing textile fabrics and other surfaces.* Patent dated January 25, 1854. (No. 190.)

*Claims.*—1. A general arrangement of machinery. 2. The use, in zincographic printing machines, of a roller or cylinder of zinc or composition metal to act as the printing surface. 3. A mode of passing fabrics through zincographic and lithographic printing machines without subjecting them to any strain by driving the delivery counter-pressure, and take up rollers by means of belt or toothed gearing. 4. The use of lithographic or zincographic rollers or cylinders for printing textile fabrics. 5. A mode of printing according to the lithographic or zincographic processes, wherein the printing rollers or cylinders are made to traverse or roll over the surface to be printed as stretched on a flat table beneath. 6. The use of isinglass, or compositions containing it, for the production of printing surfaces.

WICKSTEED, THOMAS, of Leicester, civil engineer. *Improvements in the manufacture of sewage manure.* Patent dated January 26, 1854. (No. 192.)

This invention consists in the manufacture of hollow or perforated bricks or blocks of the precipitate obtained by adding lime, either alone or together, with other

substances to sewage water, so as to facilitate the drying of the said precipitate.

WICKSTEED, THOMAS, of Leicester, civil engineer. *Improvements in the manufacture of sewage manure.* Patent dated January 26, 1854. (No. 193.)

The inventor reduces charcoal to fine powder, and thoroughly mixes it with lime and water, so as to obtain a uniform cream or milk of lime and charcoal, and causes a stream of this mixture to flow into a stream of the sewage-water by means of two pumps.

WICKSTEED, THOMAS, of Leicester, civil engineer. *Improvements in the manufacture of sewage manure, and in apparatus for that purpose.* Patent dated January 26, 1854. (No. 194.)

*Claims.*—1. The manufacture of sewage manure by causing a mixture of sewage-water and lime, either alone or together with other substances, to flow continually through a reservoir, so that the precipitate may be separated from the water by a continuous process. 2. Constructing reservoirs for the manufacture of sewage manure with a series of apertures at one or both ends, arranged so as to produce a continuous current through the mass of the liquid. 3. The construction and application, in connection with a reservoir, for the manufacture of sewage manure, of a Jacob's ladder or endless chain of buckets, enclosed in a trunk or case, whereby the precipitate is raised without contact with the supernatant water. 4. The combination of a reservoir and screw and Jacob's ladder.

REEVES, CHARLES, junior, of Birmingham, Warwick, manufacturer, and WILLIAM WELLS, of Sutton Coldfield, near Birmingham, carpenter. *An improvement or improvements in casting metals.* Patent dated January 26, 1854. (No. 196.)

This invention consists in keeping the level or surface of the metal in the mould, as near as is practicable, to the level of the melted metal in the vessel from which it is poured, by giving motion either to the mould or to the vessel.

SMITH, SYDNEY, of Hyson-green works, near Nottingham. *Improvements in valves or apparatus for regulating the passage and supply of fluids.* Patent dated January 26, 1854. (No. 197.)

This invention consists in forming valves of portions of spheres, fitted and ground to suitable seats, and moving on spherical joints or on axes, in such manner that each valve is balanced when it is closed, and the pressure of fluid is on one side of it.

STALLARD, SAMUEL SLACK, of York-street, Welford, Leicester. *Improvements in the manufacture of knit fabrics.* Patent dated January 26, 1854. (No. 198.)

*Claim.*—The manufacture of knit fabrics with one side or surface of loose pile, produced by the introduction of warp threads or yarns looped on to the needles at intervals.

FIRMIN, GEORGE, of Bath, Somerset, contractor. *Improvements in anchors.* Patent dated January 26, 1854. (No. 199.)

A full description of this invention is given in a former part of this Number.

CRANE, PATRICK MOIR, of Canonbury-villas, New North-road, Islington, Middlesex, gentleman. *An improvement in the manufacture of iron.* Patent dated January 27, 1854. (No. 201.)

This invention consists in "the production of more thorough combustion of the gases evolved in the blast furnace, and the use thereof in smelting iron, by combining them with blasts of hot or cold air issuing from blow pipes acting above the tuyers."

SIEMENCOURT, ALPHONSE CAJETAN DE, of Paris, France. *Improvements in composing and distributing type.* Patent dated January 27, 1854. (No. 202.)

The inventor proposes to construct certain machinery by which the composition and distribution of type is to be effected.

TENDALL, HENRY, of Hoxton, engineer, and WILLIAM ST. CLAIR TROTTER, of London. *Improvements in machinery and apparatus for crushing, washing, and amalgamating auriferous quartz and other ores.* Patent dated January 27, 1854. (No. 204.)

The inventor constructs a conical body which revolves in a metal basin, and is held therein by a pin projecting upwards from the centre of the basin and fitting into an aperture in the bottom of the crushing body, the upper part of which is held by another pin, which fits into a slot cut in the arm of a wheel connected with bevel-gearing, by which it is put in motion.

THURLBY, THOMAS, of Guildford-street East, Spa-fields, Middlesex. *Improvements in the means of effecting instant communication between distant points of railway trains.* Patent dated January 27, 1854. (No. 205.)

The inventor proposes to employ compressed air conveyed from one point to the other, by suitable pipes attached in some convenient position to the carriage.

PALMER, WILLIAM, of Brighton, Sussex. *Improvements in the manufacture of materials for, and in constructing houses and other buildings.* Patent dated January 27, 1854. (No. 206.)

This invention consists in "the manufacture of tubes or hollow forms of earthenware or brick earth, suitable for constructing and in the construction of houses and other buildings with tubular or hollow forms of earthenware or brick earth."

PARTINGTON, WILLIAM, of Bolton-le-

Moore, Lancaster, engineer. *An improved construction of safety-valve for steam engines.* Patent dated January 27, 1854. (No. 207.)

*Claim.*—The combination of a loaded valve placed within a closed chamber with a whistle or other alarum.

Atkinson, Joseph, of Richmond-grove, Middlesex, engineer. *Improvements in thrashing-machinery.* Patent dated January 27, 1854. (No. 208.)

*Claim.*—The application to thrashing-machines of rotating rollers, discs, wheels, or other analogous contrivances provided with projecting ribs, teeth, spikes, or prongs for the purpose of beating, rubbing out, or detaching from the ear the corn or grain contained therein; also, the use of a travelling band, armed with spikes, for the purpose of feeding the corn into the machine, &c.

Clark, Josiah Latimer, of Chester-villas, Canonbury-park, Islington. *Improvements in apparatus for conveying letters or parcels between places by the pressure of air and vacuum.* Patent dated January 28, 1854. (No. 212.)

This invention relates to improvements in the means of maintaining the requisite vacuum, and in combining the apparatus employed, and consists mainly in using an inverted vessel, similar to a gasometer, placed in a tank or cistern of water, into which a branch-pipe from the passages used for conveying letters or parcels ascends.

Williams, Wellington, of Cheapside, London, manufacturer. *A method of and apparatus for heating the heaters of box-irons and other like purposes.* Patent dated January 28, 1854. (No. 213.)

The inventor heats the heaters of box-irons, Italian irons, goffering rollers, &c., in chambers, the exteriors of which only are exposed to the action of the fire or furnace.

Bethune, Donald, of Toronto, Canada West. *Improvements in the construction of vessels propelled by steam or other motive power.* Patent dated January 28, 1854. (No. 215.)

*Claim.*—Constructing ships with sides raised at and near the middle of their lengths, for effecting the following objects: 1. Strengthening those parts of ships which are usually the weakest. 2. Enabling ships to be built considerably longer in proportion to their width of beam and depth of hold than heretofore; and, 3. To admit of larger wheels being employed than heretofore.

Hodgson, William, of Wakefield, York, engineer. *Improvements in machinery for the manufacture of looped fabrics.* Patent dated January 30, 1854. (No. 223.)

This invention consists in certain arrangements of machinery whereby a sliver, as it comes from a carding-engine or other source, is first divided, laid, and formed into threads or threadlike substances, which are then placed in needles; when, by the aid of a presser-bar and hooks, the threads are looped and formed into a looped fabric. A sliver is delivered from a carding engine or other source on to an endless web, which places the sliver between two small rollers, from which a card-roller takes off a sufficient quantity of fibre to make a thread of the thickness required. From the card-roller the fibre is received on to a roller armed with teeth or gills in double rows. One row in each set of gills is stationary on the roller, while the other row has a to-and-fro motion imparted to it across the machine by means of cam-shaped guides, one on each end of the axis of the gill-roller. The object of this gill-roller is to lay the fibres lengthwise across the machine. Beyond the gill-roller is a roller revolving over a concave dish. One part of the surface of this roller along its whole length has a card fixed upon it, and it is caused to make four revolutions or upwards to every revolution of the gill-roller. The card takes off the fibre from the gills, rolls it into a thread or thread-like substance between this roller and the concave dish, and on reaching the further end of this dish, the thread is taken by what is termed by the inventor revolving circular shuttles, which lay it on a series of fingers or guides arranged across the machine; which fingers, in their turn, deposit the thread on a row of needles fixed in a needle-bar, extending also across the machine. After so depositing the thread, the fingers move out of the way of the needles. A presser-bar now presses down the barbs of the needles, while a series of hooks, set in a similar bar to the needle-bar, bring up a thread (laid at the back end of the needles) over the barbs and ends of the needles, the presser-bar moving out of the way to permit of the thread so passing; the hooks then carry back the two threads, one over and the other under the barbs of the needles; the operation is repeated with another thread, and thus a looped fabric is produced. The necessary advancing, receding, and other motions of the fingers and bars are effected by cams and eccentrics, while the rotary movements of the rollers are imparted from some prime mover through toothed wheels, which are so regulated as to produce the relative speed of the various parts. The shafts on which the cams and eccentrics are mounted are also driven by toothed gear. The inventor finds it advisable to keep the needles warm during the working of the machine, and this he effects by carrying a steam pipe or other heating medium across the machine and under the needles.

STRATFORD, BENJAMIN O'NEALE, Earl of Aldborough, of Stratford-lodge, Wicklow, Ireland. *Improvements in ærial navigation.* Patent dated January 30, 1854. (No. 224.)

This invention mainly consists in the construction of wings to be used in propelling ærial machines, in such manner that "they compress the air by percussion and force it under the concave part of each wing, currents of air being also impelled towards the same parts by fanners, which act on the same principle as that on which, the inventor believes, the *alæ spuriæ*, or spurious pinions, of birds act, the centre of pressure caused by their combined action, and also by the current or currents of air which pass under the wings, in consequence of the progression of the ærial machine creating a support under each wing, and consequently at each side of the weight to be raised or sustained."

*** The documents of No. 176 are with the Law Officer under objection.

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BOUVET, JEAN MARIE JULIEN LOUIS, of Boulevart St. Martin, Paris, France. *Certain improvements in kneading-machines.* Application dated January 23, 1854. (No. 169.)

These improvements consist in constructing a square kneading-box or trough, which swings in gudgeons on its ends, and which, being filled with the materials to be kneaded, and closed by a lid, is set turning by means of a toothed wheel keyed on one of the gudgeons, into which gears a suitable train of wheels, the last of which is driven by a handle.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of Finsbury, London. *Improvements in the preparation and combination of fatty and resinous bodies, and vegetable and other wax, for the manufacture of candles; also in the preparation of a wick to be used for the same.* (A communication.) Application dated January 23, 1854. (No. 170.)

These improvements mainly consist "in combining resins, resinous gums, adipocire and analogous substances, vegetable tallow, resinous and vegetable wax of every denomination, which latter is generally gathered from certain trees, or found in fossil masses in the earth in various parts of America, after epuration with acid or neutral fatty matters previously prepared."

WAGNER, ADOLPHUS THEODORE, of Berlin, Prussia, professor of music. *A psychograph, or apparatus for indicating persons' thoughts by the agency of nervous electricity.* Application dated January 23, 1854. (No. 173.)

A description of this invention was given, vol. lx., p. 107.

WILLIAMS, GEORGE, of Cannon-street, St. George's-in-the-East, Middlesex, plumber. *Improvements in the construction of water-closets.* Application dated January 24, 1854. (No. 175.)

This invention consists in applying to an ordinary water-closet a lever to be acted upon by the feet, as a substitute for the usual valve-handle.

SCHLOSSMACHER, JEAN LOUIS, lampmaker, of Paris, France. *An improved support of lamps.* Application dated January 24, 1854. (No. 177.)

The inventor forms his lamp support hollow, and thus provides a receptacle for containing the trimming scissors, cottons, and an annular plate, to be placed round the burner of the lamp to receive the fragments which fall when the wick is trimmed.

ELLIS, WILLIAM IRLAM, of Salford, Lancaster, engineer. *Certain improvements in turn-tables to be employed on, or in connection with, railways.* Application dated January 24, 1854. (No. 179.)

This invention relates to the employment of a *fixed* central pillar or stud, upon which the turn-table is made to rotate.

MINGAUD, JOSEPH AUGUSTE, manufacturer, of St. Pons (Hérault), France. *Certain improvements in producing ornamental surfaces on velvet or other hairy cloths or fabrics.* Application dated January 25, 1854. (No. 184.)

The inventor passes the fabric over a roller, in proximity to which is a revolving cylinder having spirally curved blades upon it, which run close to a fixed blade, and act as shears or scissors to cut the pile of fabric; and he produces designs or ornamental surfaces on the fabric "by employing an engraved roller, or a roller whose surface is higher or more prominent at one part than another."

PETRIE, JOHN, jun., of Rochdale, Lancaster. *Certain improvements in apparatus for dyeing wool after it has undergone the process of washing or scouring.* Application dated January 25, 1854. (No. 187.)

This apparatus consists of a chamber heated by steam-chests, or hot-air chests inclosed in brickwork, or other suitable material, through which chamber the wet wool is conducted upon an endless surface or surfaces over or between the several steam chests; there is an outlet from the chamber for the escape of the vapour produced as the drying process goes on.

THORNTHWAITE, WILLIAM HENRY, of Newgate-street, London, operative chemist. *An improvement in the manufacture of sulphuric acid.* Application dated January 25, 1854. (No. 188.)

This invention consists in "The use of some catalyzing agents, as platinized asbestos, or other platinized substance not

liable to change from the action of sulphuric acid, the sesqui-oxyde of chromium, the sesqui-oxyde of iron, the sesqui-oxyde of manganese. or other sesqui-oxyde," in the manufacture of sulphuric acid.

BROOMAN, RICHARD ARCHIBALD, of Fleet-street, London, patent agent. *A new and improved fluid for illuminating purposes.* (A communication.) Application dated January 25, 1854. (No. 189.)

This improved fluid consists of cotton seed oil combined with hydro-carbonaceous matters, the essential oil of turpentine being preferred, in the proportion of one part of the latter, by measure, to sixteen of the former.

ANDERSON, JAMES, of Auchnagie, Perth, North Britain, farmer. *Improvements in obtaining motive power.* Application dated January 25, 1854. (No. 191.)

"The essential feature of this invention consists in bringing air gases or vapours at comparatively low temperatures in contact with volatile matters at higher temperatures, which matters have been condensed or deposited upon, or in any cellular, permeable, or porous surface, the area of such surface being very considerable."

BLYTH, FRANCIS MOLLETT, of Norwich, engineer. *Improvements in the mode of heating water for steam boilers.* Application dated January 26, 1854. (No. 195.)

The inventor places tubes inside the fire-box or furnace of the boiler, so that the water being pumped in by a pipe at the bottom of, and in connection with these tubes, rises gradually up them, and passes ultimately into the boiler itself, having become heated in its passage.

ROHART, FRANÇOIS FERDINAND, chemist, of Sotteville les Rouen, France. *Improvements in the preparation of a certain substance for clarifying liquids.* Application dated January 27, 1854. (No. 200.)

The inventor describes certain methods of preparing the fibrine obtained from the blood of animals for clarifying liquids.

CHURCH, WILLIAM, civil engineer, and SAMUEL ASPINWALL GODDARD, merchant and gun manufacturer, both of Birmingham, Warwick. *An improvement or improvements in ordnance.* Application dated January 27, 1854. (No. 203.)

This invention relates to the application of certain collars, cotters, and face plates to ordnance.

FOURNIER, JULES JOSEPH LOUIS, gentleman, of Montpellier, France. *An improved mode of obtaining alcohol.* Application dated January 28, 1854. (No. 209.)

This invention "consists in utilizing for the production of alcohol a substance not heretofore employed for that purpose. This substance may be termed brewers' waste, and is a pasty residuum left after the brewing operation has been performed."

GRIST, JOHN, of the New North-road, Islington, Middlesex, engineer. *An improved break for railway and other carriages.* Application dated January 28, 1854. (No. 210.)

This break consists of two or more small wheels, which may be brought against the running-wheels of the carriage, and also against the ground or rail. These wheels are to be mounted on an axis connected with an arrangement of levers or other apparatus under the control of the guard or driver.

RAYMON, MEAD TERRY, of Clement's-lane, Lombard-street, London, general commission agent. *Improvements in apparatus for retarding and stopping trains of carriages on railways.* Application dated January 28, 1854. (No. 211.)

This invention very much resembles a former one of Mr. Raymond's previously described, page 164, vol. lx.

CHADWICK, DAVID, of Salford, Lancaster, gentleman, and GEORGE HANSON, of Manchester, Lancaster, plumber. *Improvements in metres for measuring water or other liquids, and vapours or gas.* Application dated January 28, 1854. (No. 214.)

"These improvements," say the inventors, "which are in connection with a former patent granted to us, dated 31st March, 1853, consist in the adaptation of a rotary governor, with arms or vanes, acting upon the vertical central shaft with which the conical roller or rollers is or are connected."

TAYLOR, WILLIAM GARNETT, of Norfolk-terrace, Westborne-grove, Middlesex, esquire. *Improvements in certain parts of machines employed for preparing and spinning cotton, wool, hair, silk, flax, and other fibrous substances or materials.* Application dated January 28, 1854. (No. 216.)

The inventor proposes to economise the expense of covering the rollers, cylinders, &c., employed for carding, drawing, delivering, twisting, or otherwise operating upon fibrous material, by substituting, instead of the leather usually employed, a woven or felted textile material, the surface of which is covered with a composition.

WOOLFORD, WILLIAM, of Bowling New Dye-works, Bradford, York. *Improvements in pressing and watering moreens and other fabrics.* Application dated January 28, 1854. (No. 217.)

This invention consists in a mode of pressing and watering moreens, &c., on both sides.

REDGRAVE, WILLIAM, and THOMAS REDGRAVE, of Bow-street, Covent-garden, Middlesex. *New railway signal lights, to be*

*called "Redgrave's Patent Railway Signal-light."* Application dated January 28, 1854. (No. 218.)

The inventors propose to lay down gas-pipes and to erect lamps along the line of railway, and so to arrange the parts that when a stop-cock is turned, a small jet of gas which is kept continually burning in the dark or lower compartment of the lamp, is thrown up into a brilliant light in the upper compartment, where red bull's-eyes are fixed.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury. *Improved means of preventing accidents on railways.* (A communication.) Application dated January 30, 1854. (No. 219.)

This invention consists in arranging apparatus, part of which is connected with the carriages of a passing train and part with the rails, by the action of which apparatus the switches, &c., are to be worked.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury, London. *Certain arrangements for preventing accidents on railways.* (A communication.) Application dated Jan. 30, 1854. (No. 220.)

This invention mainly consists in an apparatus composed of a dial, a moveable hand, levers, and rollers, by means of which the number of carriages in a passing train is registered.

ILIFFE, HENRY JEREMIAH, of Birmingham, Warwick, button-manufacturer, and NEHEMIAH BROUGH, of the same place, tool-maker and machinist. *Improvements in the manufacture of buttons, and in attaching them to articles of wearing apparel.* Application dated January 30, 1854. (No. 221.)

This invention consists in forming a self-attaching button, composed of a shell and a pronged shank, by which the shell is connected to the garment.

PHILLIPS, WILLIAM, of Birmingham, Warwick, gentleman. *Improvements in the manufacture of coffins.* Application dated January 30, 1854. (No. 222.)

These improvements consist in manufacturing coffins of iron, and in galvanizing, tinning, brassing, or bronzing them by any ordinary process.

COOPER, JOSEPH ROCK, of Birmingham, Warwick, gun-maker. *Improvements in preparing or constructing and dressing rolls for rolling gun-barrels, tubes, and bars.* Application dated January 30, 1854. (No. 225.)

Instead of turning the grooves of the rolls employed in rolling grooved gun-barrels and tubes in a lathe, and returning them again when they require dressing, "I form and dress these grooves," says the inventor, "by causing the rolls to revolve very slowly while I introduce between them a revolving conical or taper drill."

## PROVISIONAL PROTECTIONS.

### *Dated May* 10, 1854.

1046. Joseph Shepherd, of Manchester, Lancaster, engineer. Improvements in compound steam engines.

### *Dated June* 3, 1854.

1236. John Renton, of Bond-street, Vauxhall, Surrey, engineer, and Henry Attwood, of Holland-street, Blackfriars, same county, engineer. An improvement in the manufacture of starch applicable in part to the solidifying of colours and other substances held in solution or suspension.

### *Dated June* 5, 1854.

1250. Lemuel Brockelbank, of Willesden, Middlesex. Improvements in manufacturing lubricating matters.

### *Dated July* 1, 1854.

1443. Thomas Richards Harding, of Leeds, York, hackle and hackle-pin manufacturer. Improvements in the manufacture of the pins of hackles, combs, and cylinders, used in hackling, combing, and preparing wool, flax, and other fibrous substances, and in the mode of applying them to manufacturing purposes.

### *Dated July* 5, 1854.

1478. John Venables and Arthur Mann, both of Burslem, Stafford, earthenware-manufacturers. Printing self and other colours in bas relief or raised work on china, earthenware, glass, parian, stoneware, bricks, blocks, tiles, quarries, hardware, japan, and papier-mache ware.

### *Dated July* 8, 1854.

1501. Thomas Waller, of Ratcliff, Middlesex, ironmonger. Improvements in the construction of stoves and other fireplaces.

1503. Lorenzo Tindall, of Scarborough, York, ironmonger. Improvements in bruising or reducing grain and other substances.

1505. The Hon. James Sinclair, commonly called Lord Berriedale, of Hill-street, Middlesex. Improvements in the manufacture of paper, and in the production of textile materials.

1507. Thomas Schofield Whitworth, of Salford, Lancaster, mechanic. Improvements in machinery or apparatus for cutting or shaping wood, parts of which are particularly applicable in the construction of spinning-machinery.

### *Dated July* 10, 1854.

1509. David Beck, of Carlton-house, Southampton, doctor of medicine. Improvements in brewing and distilling.

1511. Israel Swindells, of Manchester, Lancaster, manufacturing chemist. Improvements in the treatment of wood and vegetable matters for the production of vegetable fibre.

### *Dated July* 11, 1854.

1517. Thomas Richards Harding, of Leeds, York, hackle and hackle-pin manufacturer. An improved mode of doffing fibrous materials from hackle cylinders and gill or porcupine or preparing rollers.

### *Dated July* 12, 1854.

1521. William Houghton and Robert Hoyle, both of Bury, Lancaster, machine-makers. Improvements in machinery for spinning and doubling cotton and other fibrous substances.

1523. Matthew Townsend, of Leicester, manufacturer. Improvements in the manufacture of knitted fabrics.

1525. Luke Cooke, of Sowerby-bridge, York, manager. Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.

1527. Thomas Edwin Moore, of St. Marylebone, Middlesex, engineer. Improvements in apparatus to be used for extinguishing fires.

1529. Alphonse Julien Loiseau, mechanist, of Paris, France. Certain improvements in manufacturing fringes and other plaited fabrics.

1533. Charles Durand Gardissal, of Boulevart St. Martin, Paris, France. A stamp-safe.

*Dated July* 13, 1854.

1535. William Flitcroft, of Bolton, Lancaster, manufacturer, and Thomas Evans, of Manchester, same county, printer. Improvements in printing and finishing floor-cloths, or any other fabrics or materials printed in oil colours. A communication.

1537. Thomas Bennett Foulkes, of the firm of Abel and Thomas Bennett Foulkes, of Chester, glove-manufacturer. Improvements in the manufacture of self-adjusting gloves.

1539. Lionel Lawson, of Paris, France, manufacturer. Improvements in printing.

1541. John Hackett, of Derby, manufacturer. A new method of fastening the ends of India-rubber elastic cord, and India-rubber elastic web.

*Dated July* 14, 1854.

1545. Alexander Southwood Stocker, of Poultry, London, manufacturer. Improvements in axles.

1547. Charles Sewell, of Longton-lodge, Longton-grove, Sydenham, Kent, builder. An improvement in spring-hinges for doors and gates.

1549. John McGaffin, of Liverpool, Lancaster, engineer. Improvements in the mode of corrugating angular iron.

1551. James Derham, of Bradford, York, manager. Improved machinery for combing wool and other fibrous substances.

1553. Jean Baptiste Dechanet and Antoine Dominique Sisco, of Paris, France, gentleman. Certain improvements in the construction of railway carriages.

*Dated July* 15, 1854.

1554. Elijah Henry Brindley, of Longton, Stafford, engraver. Certain improvements in printing or ornamenting china, earthenware, and glass.

1555. James Taylor, of Burnley, Lancaster, cabinet-maker. An improved clothes-peg. A communication.

1556. Ralph Waller, of Manchester, merchant and manufacturer. Improvements in the manufacture of letters and figures, and of ornamental signboards and other tablets, and in affixing letters, figures, or ornaments to glass.

1557. François Victor Guyard, engineer, captain to the town of Gravelines, France. Certain improvements in the electro-telegraphic communications for preventing mischances during the passage of trains on railways.

1558. Thomas Wright, of George-yard, Lombard-street, London, engineer. Improvements in the permanent way of railways.

1559. John Ashworth, of Turton, Lancaster, cotton-spinner. Certain improvements in apparatus to be employed in the construction of the permanent way of railways.

1560. Thomas Summerfield, of Birmingham, Warwick, glass-manufacturer. The manufacture of chromatic glass and glass-faced bricks, which said bricks are applicable to face-work or fronts of buildings, basements, pilasters, string courses, door and window-heads, modillions, cornices in part or whole, or other purposes where a superior finish and durability are required; a part of which is also applicable to bricks made wholly of clay.

1561. William Hunt, of Tipton, Stafford, manufacturing chemist. Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.

1562. George Wade Kelsey, of Hope Farm, near Folkstone, Kent. Improvements in air-engines.

1563. Matthew French Wagstaffe, of Walcot-place West, Lambeth, Surrey, surgeon, and John William Perkins, analytical chemist, of Poplar-terrace, Poplar, Middlesex. Improvements in obtaining metals from ores and oxides.

1564. Joseph Spires, of Cleveland-street, Fitzroy-square, Middlesex, gun-maker. Improvements applicable to boots and shoes.

*Dated July* 17, 1854.

1565. John Bailey Denton, of London and Stevenage. Improved hoes and spuds.

1566. Thomas Mayos Woodyatt, of Kinver Mills, Stafford, screw-manufacturer. An improvement or improvements in consuming or suppressing the smoke of steam-engine boiler and other furnaces.

1567. George North, of Lewisham-road, Kent, coach-builder. An improved apparatus to be attached to garments for protecting watches, purses, and other articles from being stolen from the person.

1568. William Warcup, of Lyndhurst Villa, Coronation-road, Bristol, Somerset, contractor. Improvements in the construction of springs for carriages and similar purposes.

1569. John Lockhart, junior, of Paisley, Renfrew, wood-turner. Improvements in the manufacture of bobbins.

1571. John Livesey, of New Lenton, Nottingham, lace-maker. Improvements in lace-machinery, and in fabrics manufactured by such machinery.

*Dated July* 18, 1854.

1573. Henry Hitchins, of King William-street, London, engineer, and William Batley, of Dean-street, Middlesex, mechanic. Certain combinations of materials suitable for mouldings and medallions, and to be employed as a substitute for wood, gutta percha, and other like materials.

1577. Auguste Edouard Loradoux Bellford, of Castle-street, London. A new kind of piston. A communication.

1579. Peter Cato, of Liverpool, Lancaster, shipbuilder. An improved trough or manger for holding the provender of horses, cattle, and other animals.

1581. Alexander Dalgety, of Florence-road, Deptford, Kent, engineer. Improvements in the reduction of friction.

1583. Samuel Mitchell, of Dewsbury, York. Improvements in the manufacture of cards for carding wool, cotton, silk, and other fibrous materials.

*Dated July* 19, 1854.

1585. Jonas Whiteley, John Slater, and William Henry Crossley, all of Halifax, York. Improvements in machinery or apparatus for preparing and spinning wool and other fibrous substances.

1587. William Ball, of Rothwell Kettering, Northampton, iron-founder and agricultural implement maker. Improvements in drills.

1589. Francis Herbert Wenham, engineer, Effra Vale, Lodge Bridge, Brixton, Surrey. Certain improvements in steam engines.

*Dated July* 20, 1854.

1590. John Sudbury, of Halsted, Essex, and Samuel Wright, of Clare, Sussex, gas engineer. Improvements in taps and valves, and in the method of working them for the purpose of regulating the passage of fluids.

1592. Jean Barthelemy Gillet, of Agde (Hérault), France. Improvements in capstans, winches, and windlasses.

1594. Joseph Barnes, of Church, Lancaster, coal proprietor. Certain improvements in furnaces or fireplaces.

1596. John Hackett, of Derby, manufacturer. Covering India-rubber thread, whether vulcanized

or otherwise, with sewing silk, and with other articles.

*Dated July* 21, 1854.

1598. Thomas Chambers, jun., of Colkirk, Fakenham, Norfolk. Improvements in machinery for distributing manure.

1602. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of metallic spring. A communication.

1604. John Knight, of Birmingham, Warwick, gentleman, and James Stubbs, of Oldbury, Worcester, mechanical engineer. An improvement or improvements in the manufacture of bricks, tiles, pipes and such other articles as are or may be made of clay, which improvement or improvements may also be applied to the manufacture of artificial fuel and to other mixing and tempering processes.

1610. Mary Ann Stevens, of West Derby-street, Liverpool, milliner. Improvements in bonnets.

1612. Henry Francis, of the Strand. An improvement in feeding fuel on to the fire-bars of boiler and other furnaces.

*Dated July* 22, 1854.

1614. Thomas Firth, machine-maker, of Huddersfield, and John Wilson, finisher, of Mirfield, in the West Riding, York. Improvements in finishing woollen, worsted, silk, and other woven fabrics, and in the apparatus employed therein.

1616. William Septimus Losh, of Wreay Syke, near Carlisle, Cumberland, gentleman. Improvements in bleaching.

1618. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the treatment, cleansing, and dyeing of fibrous and textile materials. A communication.

*Dated July* 24, 1854.

1620. Edward Francis Hutchins, engineer, of Whitechapel-road, Middlesex. Constructing the cylinders of engines worked by steam, air, or other fluid body, in a circular form on plan, by which means more power is obtained from a given quantity of the said fluid body in cases where a circular motion is required than by any other known form of cylinder.

1622. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the preparation of silk. A communication from Charles Louis Alexander Williot, of St. Quentin, France, merchant.

1626. Beaumont Cole the younger, of Deardsend, Knebworth, Hertford, engineer and machinist. Improved agricultural machinery or apparatus for ploughing and grubbing.

*Dated July* 25, 1854.

1630. Ephraim Hallum, of Stockport, Chester, cotton-spinner. Improvements in machines for preparing, spinning, and doubling cotton and other fibrous substances.

1632. Peter Spence, of Pendleton, Lancaster, manufacturing chemist. Improvements in obtaining sulphur from iron pyrites and other substances containing sulphur, and in apparatus for effecting the same.

1634. William Stephens Garland and Josiah Glasson, both of Soho Foundry, Stafford, engineers and boiler-makers. A means of consuming smoke in furnaces.

1636. John McGaffin, of Liverpool, Lancaster, engineer. Improvements in constructing and applying heads to metal casks and vessels.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1653. William Beare Caulfield, of Cole Harbour, Blackwall, Middlesex, steam-boat owner. The manufacture of brushes to be used in cleaning the small tubes of steam boilers, and for other purposes. July 27, 1854.

1671. Peter George Harris, of Buckingham-street, Adelphi, Middlesex, engineer. Improvements in locomotive engines. A communication. July 29, 1854.

1673. Edmund Burke, of Upper Thames-street, London, gentleman. Certain improvements in instruments for withdrawing corks and in uncorking bottles. July 29, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August 8th,* 1854.)

725. Jean François Lucevilliard. Improvements in fastening or sustaining to the body the various parts or objects of body clothing, equipment, and harnessing.

733. Philip John Passavant and John Cure. Improvements in machinery or apparatus for combing wool and other fibrous substances.

738. Jean Marc Gustave Coste. Revivifying animal charcoal that has already been used, and obtaining by a peculiar process prussiate of potasse or soda from it.

741. Alfred Augustus de Reginald Hely. Certain improvements applicable in exhibiting artistical, natural, or other objects on a large scale.

767. John Swarbrick. Improvements in steam boilers.

768. Joseph Bentley. Improvements in breech-loading fire-arms.

770. George Seaborn Parkinson. Improvements in railway breaks.

777. John Hamilton Glassford. Improvements in lithographic and zincographic printing.

782. James Howden. Improvements in the manufacture of rivets, bolts, spikes, screw-blanks, and similar articles.

783. Constant Bekaert. Improvements in machinery for doubling, twisting, and winding flax, silk, cotton, hemp, wool, and other fibrous substances. A communication.

791. Charles de Bergue. Apparatus for acting on water and other liquid, so as to force, displace, or propel the same or a body floating thereon.

811. Jonathan Jopling. Improvements in preserving the tuyere used for blowing in forge and other furnaces from the action of the fire.

813. Thomas Wood. Improvements in centrifugal machines.

814. John Rankin. Improvements in machinery for cleaning corn and seed.

872. Joseph Croisy. Improvements in machinery for manufacturing bolts, rivets, screw-blanks, railway-pins, and other similar articles.

879. George Louis Félix Tiret. An improved canvas for embroidering.

881. Thomas Hawkins. An apparatus for creating an upward draught or current of air in chimneys, which apparatus is also applicable to the purposes of ventilation.

888. Samuel James Healey. Improvements in apparatus applicable to steam boilers for preventing explosions and saving fuel.

897. Jean François Felix Challeton. Certain machinery for purifying and condensing peat, and also for conveying it.

899. Moses Poole. Improvements in drying and weighing fibrous and other substances. A communication.

913. William Johnson. Improvements in machinery or apparatus for making bricks or tiles. A communication from Magloire Augustin Jullienne, of Paris, France, mechanical engineer.

942. William Blackwood. Improvements in the treatment and finishing of threads or yarns.

1035. Charles Liddell. Improvements in moving boats on canals and rivers.

1036. Charles Liddell. Improvements in the permanent way of railways.

1108. Oliver Maggs. An improvement in applying shafts to agricultural implements and carriages.

1208. Charles Claude Etienne Minié. Improvements in projectiles.

1248. Edward Maniere. Improvements in getting peat, and in manufacturing peat with other matters into fuel. A communication.

1482. Otis Avery. Improvements in sewing and stitching-machines.

1545. Alexander Southwood Stocker. Improvements in axles.

1549. John McGaffin. Improvements in the mode of corrugating angular iron.

1554. Elijah Henry Brindley. Certain improvements in printing or ornamenting china, earthenware, and glass.

1563. Matthew French Wagstaffe and John William Perkins. Improvements in obtaining metals from ores and oxides.

1564. Joseph Spires. Improvements applicable to boots and shoes.

1568. William Warcup. Improvements in the construction of springs for carriages and similar purposes.

1569. John Lockhart, junior. Improvements in the manufacture of bobbins.

1571. John Livesey. Improvements in lace machinery and in fabrics manufactured by such machinery.

1572. James Barlow. Improvements in the mode or method of extracting gluten from wheat or flour, and preparing the residuum for sizing purposes.

1577. Auguste Edouard Loradoux Bellford. A new kind of piston. A communication.

1584. John Collis Browne. Improvements in the manufacture of camp bedsteads.

1602. Alfred Vincent Newton. An improved construction of metallic spring. A communication.

1607. Auguste Edouard Loradoux Bellford. Certain improvements in breech-loading fire-arms. A communication.

1630. Ephraim Hallum. Improvements in machines for preparing, spinning, and doubling cotton and other fibrous substances.

1636. John M'Gaffin. Improvements in constructing and applying heads to metal casks and vessels.

1671. Peter George Harris. Improvements in locomotive engines. A communication.

1673. Edmund Burke. Certain improvements in instruments for withdrawing corks and in uncorking bottles.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

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## WEEKLY LIST OF PATENTS.

*Sealed August* 4, 1854.

1853:

992. William Tillie and John Henderson.

1854:

283. Thomas Sullivan.
287. Auguste Louis Nicolas Comte Vander Meere.
294. James Murdoch.
307. George Wigzell Knocker.
340. Jacques François Dupont de Bussac.
343. Thomas Edwards.
367. Thomas Jennings.
417. James Smith.
463. Constant François Bekaert.
479. Frederick Samson Thomas.
490. Thomas James Johnson.
505. John Simon Holland.
516. Timothy Yates and Rufus Yates.
651. Edouard de Mars.
690. Richard Montgomery.
861. Samuel Colt.
960. Joseph Barling.
969. Christopher Kingsford.
1015. Josiah George Jennings.
1017. Josiah George Jennings.
1052. Henry Doulton.
1076. Thomas George Shaw.
1129. Robert Crossland, William Holiday, and John Heaton.
1160. Thomas Ball.
1196. Henry Doulton.
1201. Edward Loysel.
1217. James Timmins Chance.
1226. Moses Poole.
1228. Isaac Taylor.
1231. Peter Armand Lecomte de Fontainemoreau.
1239. Abel Franklin Goodnow.
1257. Nehemiah Brough.
1276. James Lamb Hancock.

*Sealed August* 8, 1854.

308. John Perry.
329. Joseph Johnson.
334. Armand Jean Baptiste Louis Marcescheau.
341. George Ayres.
345. Daniel Campbell and James Barlow.
346. Edmund Clegg.
358. Samuel Perkes.
362. John Hossell.
363. John Potter.
411. John Gedge.
419. Adam Dixon.
420. Adam Dixon.
427. Damiano Assanti.
455. Auguste Edouard Loradoux Bellford.
481. Auguste Edouard Loradoux Bellford.
518. Lorenzo Tindall.
532. John Knox Stuart.
535. James Galloway.
748. Auguste Edouard Loradoux Bellford.

878. Auguste Edouard Loradoux Bellford.
1066. Auguste Edouard Loradoux Bellford.
1128. William Crighton and Andrew Crighton.
1158. Joseph Lillie.
1168. John William Jeakes.
1241. Alfred Garratt Barham
1259. Charles Anthony Perpigna.
1277. John Currie and Robert Young.
1296. John Hargrave.
1298. Frederic Martini.
1306. Richard Hornsby.
1311. Frederic Martini.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

ERRATUM.—In prolongation notice, last number, page 143, for "16th September," read "6th September."



CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

**No. 1619.]** SATURDAY, AUGUST 19, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## MALAM'S PATENT IMPROVED GAS-APPARATUS.

Fig. 4.

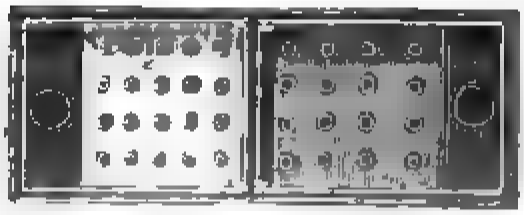


Fig. 5.

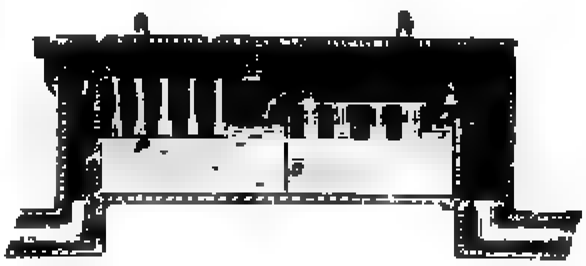
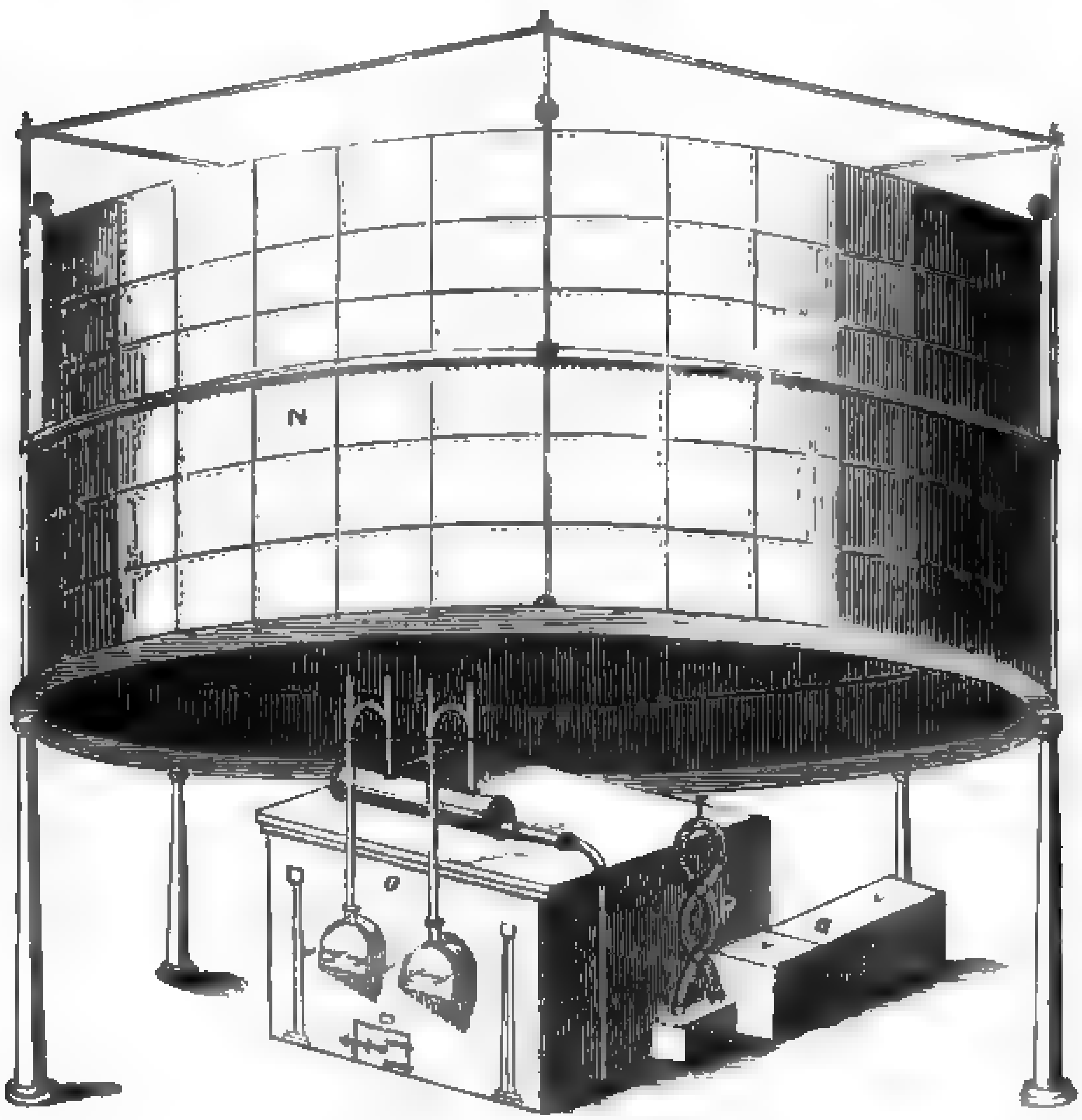


Fig. 7.



## MALAM'S PATENT IMPROVED GAS APPARATUS.

(Patent dated January 31, 1854.)

We have much pleasure in introducing to the notice of our readers several improvements in apparatus for the manufacture and holding of gas, which have been patented by Mr. Malam, of the Blackfriars-road, and some of which are of a very valuable character.

This invention consists, *first*, in constructing gas retorts with ribs or ridges rising from the bottom on the inside, to about three inches, more or less, from the surface. *Second.* In constructing gas condensers of a zig-zag, serpentine, or other than a straight form, in order to obtain a greater extent of surface in a given space than heretofore. *Third.* In constructing apparatus for washing gas in such manner, that the gas is caused to pass down into the liquid through a series of vertical pipes, and to ascend through a layer of wire gauze or finely perforated plate; and, by means of partitions in the washing vessel, is further caused to pass through as many sets as may be necessary. And, *fourth.* In constructing gas-holders by sinking to any required depth in the ground two concentric cylinders, the space between which is filled with liquid, and combining therewith a gasometer of the ordinary construction (except that the roof of it is supported by girders placed outside instead of inside the top), and weighted with balance weights as usual, if necessary, the gasometer rising and falling in the space between the two cylinders sunk in the ground according to the quantity of gas contained in it.

Fig. 1 of the accompanying engravings is a front sectional elevation of a pair of gas-retorts constructed according to the *first* part of the invention, and set over a single furnace, which is the arrangement the inventor prefers to adopt; and fig. 2 is a side elevation of a mouthpiece, which he also prefers to use with these retorts. The retorts may be composed of iron, clay, or other material ordinarily employed, and the ribs may be either formed in one with the body of the retort; or they may be formed separately, and afterwards fitted thereto. This latter plan is specially applicable to clay retorts, which are to be constructed by preference with ribs of cast iron. The mouth of the retort is formed with a flange, as shown, to enable the mouth-piece to be bolted to it by a corresponding flange, as shown in fig. 2. The bottom of the mouth-piece, A, is inclined upwards about two inches from the flange to the front lid, B, by which means any tar that may be condensed in leaving the retort, runs down the inclined floor, and mixing with the charge in the retort, becomes carbonised; thus increasing the production of gas, and reducing the difficulty and inconvenience of drawing the charge. The lid, B, of the mouth-piece is furnished with a valve to enable the charge to be stirred, so as to promote the process of distillation.

Fig. 3 is an elevation partly in section of a gas condenser constructed according to the *second* part of the invention. The tubes or pipes, *b b*, are shown as being formed with angular bends, but they may also be formed with curvilinear bends, or of any other similar construction that will give an equal amount of surface. The upper box, *c*, in which the ends of the pipes are fitted is furnished with hydraulic caps, *a*, to the pipes, so that access may be easily had to them when required.

Fig. 4 is a sectional plan, and fig. 5 a vertical section of a gas-washing apparatus, constructed according to the *third* part of the invention. This apparatus is divided by the partitions, D D, into compartments, in which are fitted vertical tubes, E E, with wire gauze, or finely perforated plates of metal, F F, placed horizontally at the lower extremities of the tubes. The gas entering at the inlet pipe passes down the tubes in the first compartment in small bodies, and then rises through the wire gauze, which divides it into minute streams, into the second compartment, from whence it again descends through the tubes, and rising through a similar wire gauze to that before mentioned, passes to the outlet, as indicated by the arrows in fig. 5.

Fig. 6 is a vertical section of a gas-holder constructed according to the *fourth* part of the invention. A circular tank or trough of brickwork, or other material, is sunk into the ground, which is left at its original level at the centre of the holder, and either covered with metal plates or concrete, to form the bottom of the holder. The gasometer is, to some extent, of the common construction, but the top is supported by stays, I I, outside, radiating from the centre to the circumference, and trussed, so as to give a slight camber to the top, in order to enable any water that might settle on it, if it were quite flat, to run off easily. The lower edge of the gasometer is furnished with a strong wooden curb, K, and friction rollers, L L, are fitted to its upper angle, which run against guides, M M, placed at intervals round the gasometer, for the purpose of maintaining it in a vertical position whilst rising and falling. Where the gasometer is of small dimensions, no balance weights are required, but they must be employed in all cases where the size of the gasometer renders them necessary. Although the gas-holder is described as being circular, it will be readily seen

that it may be of any other approved form, and the tank, instead of being sunk in the ground, may be built on or raised above it in either case, making the floor of the holder

Fig. 6.

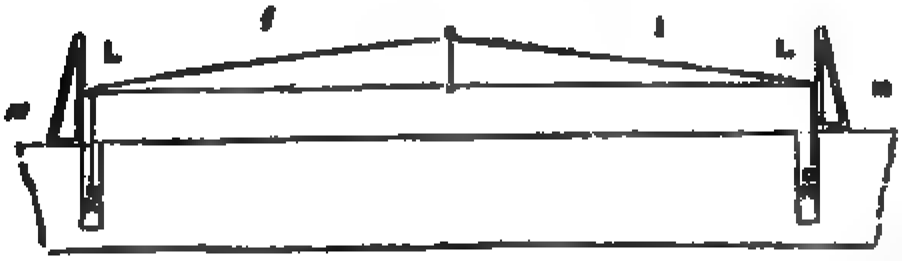


Fig. 8.

Fig. 1.

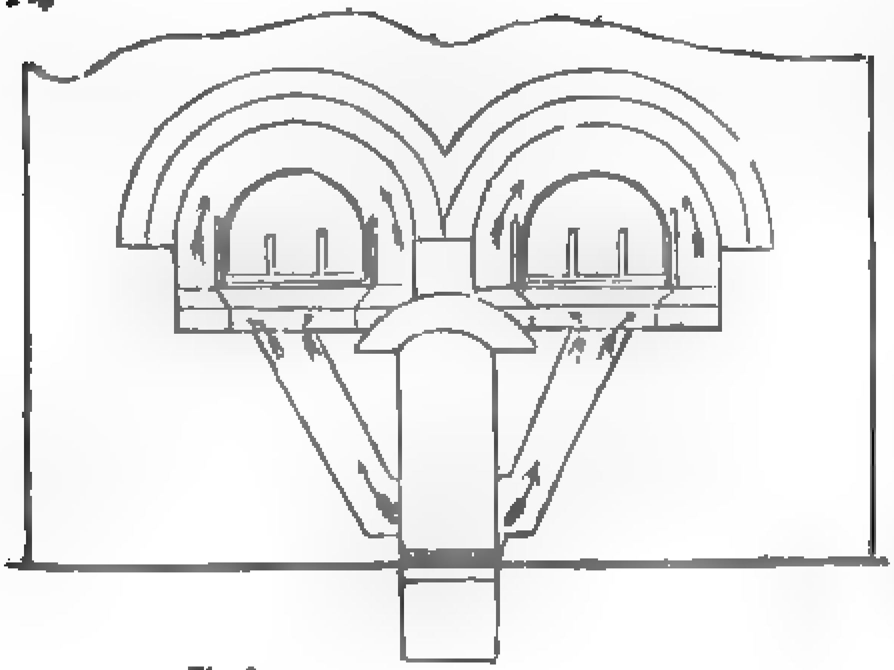
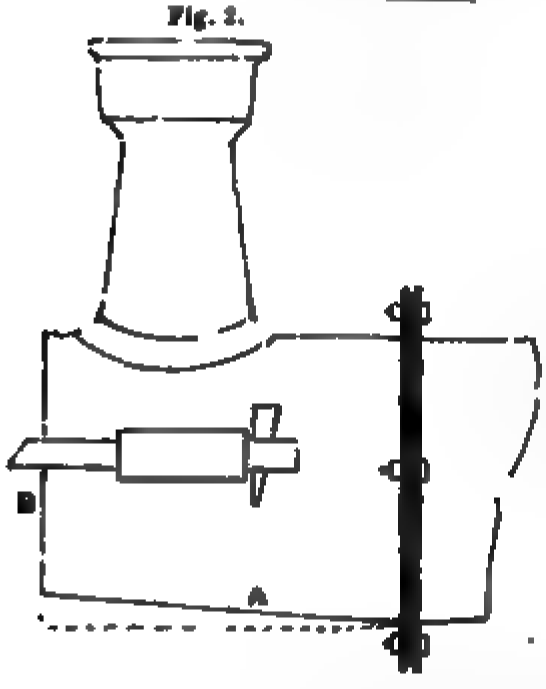


Fig. 2.



on a level, or nearly so, with the top of the tank.

Fig. 7 is a perspective view of an arrangement of apparatus combining the improvements described under the several heads of the invention. In this arrangement the gas-holder, N, is supported on four columns, and the retorts and their furnace, O, the condenser, P, and the washing apparatus, Q, are placed underneath the holder. The several parts of the apparatus are connected together by the necessary pipe connections for conducting the gas from one to the other of them. The same arrangement may be also adopted for the construction of portable apparatus, the whole being mounted on wheels, to admit of being moved from place to place, as required.

## RIFLE CANNONS.

*To the Editor of the Mechanics' Magazine.*

Sir,—In the *Sun* of the 5th inst. I read, under the heading of "The Long-Gun Range," that practice was made at Shoeburyness with a two-groove rifle 68-pounder cannon, on Mr. Lancaster's principle. This two-groove rifle-cannon has been called at

one time, "an elliptic-bore," at another time a cannon of "a particular bore;" this, I suppose, was done to make it intelligible to the public. It is now about sixteen years ago, when I, by the request of Sir William Bowyers Smyth, Bart., M.P., gave Mr. Lancaster, gunmaker, Bond-street, one of my elongated rifle percussion-shells, and it was about the same period that I successfully tested my four-groove one-pounder rifle brass cannon, at Woolwich, in presence of Lord Hardinge, the present Commander-in-Chief, the late Admirals the Earl of Camperdown, Sir Thomas Hardy, and several other officers of high rank of both the naval and military services. Lord Hardinge was pleased to write to me afterwards, saying that he was convinced that my principle of rifle cannon and its projectiles would lead to the most important results.

I am, Sir, yours, &c.,
J. Norton.

Victoria Hotel, Cork, Aug. 15, 1854.

## ON THE UTILITY OF THE MATHEMATICS.

A short time since a lecture was delivered by James Jerwood, Esq., Barrister-at-Law, to the Exeter Literary Society, "On the Utility of Mathematical Knowledge, with a Sketch of a Mode of Acquiring it." The lecture consisted of introductory observations, the definition of mathematics, a sketch of their origin and antiquity; the utility of mathematical knowledge as a mental discipline; its usefulness to every class of men in society—to the statesman, the man of fortune, the teachers of the most serious matters, to physicians and lawyers, to the military and naval professions, to engineers, shipbuilders, architects, and artizans. The Athenæum was very full, and at the close of the lecture the thanks of the audience were carried with hearty cheering. In responding to the vote, Mr. Jerwood made some remarks on the slanders which have been cast upon mathematical studies, which, we believe, will be read with interest, although we think the talented lecturer *implies* admissions which we could not ourselves concede, and which we think might influence infirm minds still to retain vestiges of unnatural prejudices against scientific studies.

If my lecture, said he, has been at all successful, I have, to some extent, pointed out to you the utility of mathematical knowledge, and I candidly admit that I have tried hard to draw your attention to the subject, with the view that you yourselves should increase your acquaintance with it. Having made this attempt, however tiresomely or unsuccessfully, I feel it to be a duty that I owe myself, in conclusion, very briefly to touch upon a topic which, perhaps, in some minds has raised doubts as to whether I ought to have given this lecture at all. It has been very positively asserted by men who, at all events, lay claim to be amongst the educated classes, and to concern themselves about education generally, that the study of science amongst the masses has a tendency to spread *infidelity;* and especially has it been asserted that the cultivation of the mathematical sciences tends to propagate *scepticism!*

Now, however enamoured I might be of any science, if there were a glimmer of reason for asserting that it had such a withering and unhappy effect upon its devotees, I freely admit that I should be most highly culpable for attempting to spread such a doctrine amongst you.

But when I reflect on our country's greatness, which depends altogether on the skill and knowledge of our countrymen, which skill and knowledge, I have no hesitation in saying, are chiefly based upon mathematical knowledge; and this is particularly the case with respect to our railways—our machinery—our shipbuilding—our navigation — our architecture — and all the principal features of our national greatness, —when I see, too, how mathematical science opens the way to all our physical knowledge, and how it brings man acquainted with the stupendous works of creation, which he could not know without it—when I see all this, I am utterly astounded at the assurance which can lead men to assert that the cultivation of mathematical knowledge tends to generate *scepticism!* That is, that the attempt to qualify ourselves to know the physical nature of the things about us —*the handiworks of our Creator*—tends to make us sceptics.

It is at once admitted that there have been many celebrated mathematicians, and men eminent in science, who were not what the sincere advocates of revealed religion could have wished them. But what of that? Is science to be slandered because some of its cultivators have had melancholy defects in their characters? Is history to be denounced, and its study forbidden, because *Hume*, and *Volney*, and *Gibbon*, and *Voltaire*, some of its more celebrated devotees, were sceptics or infidels? Cannot we find the most detestable characters even amongst the professors and teachers of Christianity itself? Is there, then, anything in the nature of history or revealed religion which has a tendency to form such characters? Cannot the gloomy defect always be traced up to some other source, and not to any inherent quality in their principal labours? Why is not the same rational equity done to science? Why try and fix the personal

defects of a few cultivators of science on science itself?

The assertion that there is something in the *study* of the mathematics which has a tendency to produce scepticism, is a piece of incomprehensible dogmatism, totally in opposition to the doctrines of the most gifted and virtuous of mankind, as well to the experience of all ages. On the contrary, Locke teaches us that the study of the mathematics cures *presumption*. Locke's doctrine plainly proves that the maligners of science are not mathematicians. Their stock of arrogance and presumption also bear witness to the fact.

Was Newton, the prince of mathematicians, a *sceptic?* Was Barrow an *infidel?* He says that the mathematics inure and corroborate the mind to constant diligence—that they wholly deliver us from a *credulous* simplicity—that they most strongly fortify us against the VANITY of SCEPTICISM, and effectually restrain us from a rash PRESUMPTION. Such were the sentiments of Barrow, who was a profound mathematician, a learned theologian, and a devout Christian.

But if science be allied to *infidelity*, and mathematics to *scepticism*, the inference is, that mankind would be benefited if the whole were annihilated. The slanderers of physical knowledge must wish to have it understood that the light of science is only an ignis fatuus, which misleads, and that therefore it should be extinguished for the general welfare. This is saying that all knowledge, all power, all happiness that has for its basis mathematical or scientific knowledge should be swept away. Now, if the arch-enemy of mankind were to exert his ingenuity to the utmost, could he devise a scheme that would more absolutely debase man, and sink him lower in the scale of rationality, than such a plan? Take our shipping. Our navigation depends on the continuous efforts of mathematical science applied to physical astronomy; not only for its safety, but for its continuance at all. Our ships might creep round by our coasts, but it would be sheer insanity to attempt distant voyages without the guides which science alone can supply. "Aye," it may be answered, "but your ships sail across vast oceans, and visit distant lands, only in search of wealth and luxuries, which are pernicious in their effects, and which we should be better without." True, they increase our wealth and power as a nation; but is that all? Wherever our ships carry our stores, or take our merchandise, do they not carry the tenets of our religion? Have they not been the means of spreading the light and happiness of gospel truths in distant lands, where they found intense mental darkness, and all the horrors of superstitious ignorance? Should this be stopped? Is it not almost impious to attempt to prevent it? Among other splendid achievements of mathematical science, the Christian thankfully acknowledges that by its aid the blessings of true religion have been carried into the benighted regions of heathenism.

What, let me ask, have the slanderers of science done towards removing the sceptic's doubts? *Nothing*. What stumbling-block have they removed from the Christian's path? None whatever. What have the whole herd of them done that can be compared with Mr. Babbage's confutation of Hume's argument, that I mentioned just now? Nothing. They can only groundlessly condemn what they have not the ability, or are too indolent to take the trouble to understand, and cast their aspersions at matters which, perhaps, they want the capacity to comprehend.

There have, however, been men of this kind in all ages. Lactantius declared that all natural philosophy was false. His mantle has fallen on men of our generation. Some of Galileo's countrymen refused to look into his telescope, because it showed facts which they would not believe. The same mental perversity is evident in our day. A Brahmin crushed with a stone the microscope that first showed him living things among the vegetables of his food. The spirit of the Brahmin lives in Christendom. In the Jesuits' edition of our Newton's "Principia," printed in 1822, they were obliged to say that the earth's motion was only *admitted* as a theory. The arrogance and folly of the Vatican, that issued its fulminations against the doctrines of the earth's movement, are still manifest even in England. However, the endeavours to stigmatise science, and to prejudice the sources of knowledge, are never made by the distinguished in science, or the eminent in philosophy. The aspersion may always be traced up to a certain class, "peculiar," as a celebrated writer says, "in its pschycological qualities. They assume to be endued with the spirit of prophecy, and they always vaticinate evil: like birds of bad omen, they scent coming ills from afar, and croak approaching disasters at a distance; they appear to spend their time in the practice of a perverted alchemy, and try to extract dross out of gold, and evil out of good."

But these foreboders of evils that are always coming, may be of good cheer. Teachers after their own hearts, and *suitable* to their understandings, are springing up. One of them, I believe at Rome, has just started a new and characteristic solar sys-

tem, in which the sun is only about six feet in diameter, and only about 115 yards above us, much less than the height of some of our buildings; consequently, if these *new lights* make some erections for stations directly under the sun's tract, they will be enabled to get up just as he is passing, hold on, and inquire of the solarians if they want anything in their way. However, enough of this. The slanderers of science would be thoroughly ridiculous if they were not mischievous.

I repeat that I believe the faculties for acquiring mathematical knowledge were given to man by his beneficent Creator, purposely that he might become acquainted with the works of the universe, which can only be known through their instrumentality; and that the aspersions which are sought to be cast on mathematical knowledge and the sciences are as groundless as they are disgraceful to those who throw them. They are the outpourings of stolid bigotry or deceitful hoodwinking craft; but whether those slanders are the offspring of ignorant conceit, or a moping apprehension of the light of knowledge, they are no credit to the age in which we live. I trust that you will not permit them to have the slightest influence on your studies, and I am sure as you proceed, you will feel convinced that these aspersions on science are as unfounded as they are utterly contemptible.

## LIGHTNING RODS—HEATING BY HYDROGEN.

At a recent meeting of the *Franklin Institute*, Dr. Rand exhibited a model of the form of lightning-rod proposed by Mr. J. L. Gatchell, and explained that no novelty was claimed for the rod, except the combination in one of all the means which experience and theory had shown to be most effective in producing the required protection. The rod terminates above in a platina point, secured upon a similar point upon the rod itself, and surrounded by a brush or row of copper points (as proposed and applied by Dr. Hare), pointing outwards at an angle of about 45°, and secured at their bases into a ball of zinc screwed or soldered upon the rod; this combination of metals being used to prevent the rusting of the copper. The separate joints of the rod are to be secured by screwing, and pass through glass insulators (not, as the inventor states, from any impression of the practical importance of such insulation, but in deference to the time-honoured prejudices of the people). At the lower end, again, the rod terminates on the level of the ground in a zinc ball, from which a number of copper rods pass down to water. This arrangement being adopted to prevent the rusting off of the rod, which not unfrequently takes place where iron is used just below the surface of the ground.

Professor Frazer took the opportunity now afforded at the opening of the season most abundant in thunder-storms, to call the attention of the members to the true theory of the protection afforded by the lightning-rod, which, notwithstanding all that had been done on the subject, seemed to be less understood among us than in the days of Franklin. He cited the experiment of Professor Henry, by which it was shown that the rod was under the influence of the approaching cloud while yet at a great distance (20 miles), and hence showed the value of Dr. Hare's brush, which presents points directly towards the approaching cloud, whilst the upright extremity of the rod is prevented from acting. He also called attention to the great importance of a perfect conducting medium between the point and the moist earth, since the current through the rod, at the commencement of the action, must be exceedingly feeble, and therefore liable to be interrupted by the slightest break. This he considered as the prominent defect in the rod of Mr. Armitage, at least as put up in this neighbourhood. The same fact of the inductive action of the rod while the cloud was at a great distance, and the consequent feebleness of the current produced, explained the importance of having a sufficient cross-section of the conductor, and the fallacy of depending upon mere surface; for although it appears that electricity of tension passes exclusively on the surface of conductors (Henry), yet the galvanic current, which more nearly resembles the case under consideration, passes more freely as the area of cross-section is increased. He also called the attention of the members to the cases where a lightning-rod has been known to be struck, that is, to receive a perceptible spark; and doubted whether in every case where this had been seen, a careful examination would not show a want of perfect conduction somewhere in the apparatus, and a consequent loss of the first and important inductive influence of the rod. This interruption he explained as most likely to occur by the rusting of the rod just below its entrance into the ground, and he therefore considered the modification shown to-night as an improvement, inasmuch as it tended to prevent such an accident.

In reference to the insulation of the rod, Professor Frazer considered it as entirely unimportant, except in cases where the building contained masses of metal, which

should always be connected with the rod, in order to prevent the lateral shock.

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Dr. Henry Hartshorne made the following remarks on the use of hydrogen as a calorific agent: The practicability and convenience of cooking and warming rooms or houses by gas, has been proved by numerous and sufficient trials. Its advantages over the ordinary employment of anthracite are obviously immense, except in the one item of *expense*. Those interested in the subject, have, therefore, been waiting in anticipation of a possible reduction in the price of gas. According to a calculation based upon statements made by Mr. Mayer, who has devised and put in use an excellent gas-cooking apparatus, it would require the reduction of gas to *one-half* its present cost to the consumer, in order to make its use in ranges and stoves as economical as that of coal. If gas were but 1·00 dollar per thousand feet, the end would be gained.

But instead of reduction, a proposition has been recently made in the city councils to *increase* the price of gas, on account of the greater present expense of the materials from which it is made. In view of this fact, and of the very high price of the coal used for domestic purposes, two questions are very naturally suggested: 1. Can a *cheaper* quality of the ordinary luminous gas be made, containing less carbon, and therefore unfit for light, but well adapted for calorific use? 2. If that be impracticable, cannot some *other* gas be substituted for this purpose, as, for instance, hydrogen?

If either of these inquiries may be answered in the affirmative, it will have an important bearing on the interests of all householders. For, if light is an object of consequence, heat is still more indispensable; if light ever has been and must be expensive, heat for cooking and warming our domiciles must ever require a still greater expenditure. The contrast between the old-fashioned, dull, and disagreeable glimmering of oil lamps and the delightful convenience of gas, is not by any means so great as would be the change from the time-reconciled use of coal-bins, coal-scuttles, shovels, and ash-barrels, to the clean and comfortable substitute of simple gas-burners arranged in Mr. Mayer's stoves.

Putting aside, for the present, the question as to the possibility of making a cheap hydro-carbonous gas for heating purposes, let us consider the subject of hydrogen, as this gas is known to produce more heat in burning than any other substance.

There are at least three ways of manufacturing hydrogen gas.

1. By decomposing water through the means of the voltaic battery.

2. By the action of dilute sulphuric acid upon zinc or iron filings.

3. By passing the vapour of water over iron filings heated to an intense redness, or over coke.

The first of these methods has, perhaps, the greatest scientific beauty. Take, for example, a Bunsen's battery of a large number of cells; immerse the wires in water, the vessel containing which is divided by a septum into two parts; at the one pole will be given off hydrogen—at the other oxygen gas, in the proportion of two volumes to one. The gases may be collected in separate reservoirs, and rejoined in a jet at the desired place, on the plan of Dr. Hare's compound blow-pipe. The most intense heat can thus be generated.

Unless, however, as Professor Frazer has suggested, some improvement in the adaptation of the battery be obtained, so as to make the residue of the process available in some way, this plan of producing heat appears to be outside of the pale of *economy*.

With regard to the second method, the same objection would probably apply; a considerable amount of zinc or iron, as well as of sulphuric acid, being consumed in the process, and the resulting compound having but little value.

As to the third method, Dr. Kennedy informs us that in some parts of New England, hydrogen gas is manufactured by passing steam over heated iron filings, in order to *dilute* a luminous gas made from rosin. The substitution of coke for the iron filings has been devised by M. Gaillard, of Paris, who constructed a burner in which a jet of hydrogen made luminous a platinum wick; and the expense of this process, apart from the platinum, Dr. Rand believes to have been but 30 cents per thousand feet. The experiment has been repeated, in part at least, at the gas-works in this city. Now, if the cost of hydrogen used as a calorific gas be but 30 cents per thousand feet at the gas-holder, it will be an interesting inquiry easily solved by those familiar with gas manufacture, at what cost the same gas can be furnished, through main, pipes, and meters, *to the consumer?*

This, therefore, is the question intended to be suggested by these remarks; and, with a view of eliciting important information with regard to it, I make the following distinct proposition:

I propose, as the most convenient and desirable mode of supplying heat for cooking and warming purposes, the use of *hydrogen gas*, manufactured by passing the vapour of water over coke at a sufficient temperature, distributed through apparatus similar to that now in use for luminous gas, and applied by means of stoves, heaters, and

ranges of such construction as shall prove, upon trial, to be the best.

I submit that if this can be done at a cost to the consumer of not more than 1·00 dollar per thousand cubic feet, it will be equal in economy to the ordinary use of anthracite, and vastly superior in comfort, cleanliness, and convenience. One very great advantage, affecting even the health is, that hydrogen produces *only water* in burning. The objection apparent at first sight in regard to the necessity, were such a plan approved, of creating new works, pipes, meters, &c., for the calorific gas, in addition to those already laid for the luminous carbo-hydrogen, is really null. The whole matter turns upon the question of expense. If it *pays*, it should be done, precisely as all who can afford it have pipes with warm water to supply their bath rooms, with none the less readiness because they already have had cold water pipes in the same place.

The remarks gave rise to an interesting discussion, which was participated in by Professor Frazer, Dr. Rand, Dr. Hartshorne, Dr. Kennedy, and Mr. Williams. At the request of Dr. Hartshorne, the subject was referred to the Committee on Science and the Arts for investigation.

## THE CRYSTAL PALACE AT SYDENHAM.

I read the account in the *Times* newspaper of the opening of the Crystal Palace at Sydenham, as I ascended the hill between Vevay and Chatel St. Denis, and the thoughts which it called up haunted me all day long, as my road wound among the grassy slopes of the Simmenthal. There was a strange contrast between the image of that mighty palace, raised so high above the hills on which it is built as to make them seem little else than a basement for its glittering stateliness, and those low larch huts, half hidden beneath their coverts of forest, and scattered like grey stones along the masses of far away mountain. Here, man contending with the powers of nature for his existence; there, commanding them for his recreation; here, a feeble folk nested among the rocks with the wild goat and the coney, and retaining the same quiet thoughts from generation to generation; there, a great multitude triumphing in the splendour of immeasurable habitation, and haughty with hope of endless progress and irresistible power.

It is indeed impossible to limit, in imagination, the beneficent results which may follow from the undertaking thus happily begun. For the first time in the history of the world, a national museum is formed in which a whole nation is interested; formed on a scale which permits the exhibition of monuments of art in unbroken symmetry, and of the productions of nature in unthwarted growth,—formed under the auspices of science which can hardly err, and of wealth which can hardly be exhausted; and placed in the close neighbourhood of a metropolis overflowing with a population weary of labour, yet thirsting for knowledge, where contemplation may be consistent with rest, and instruction with enjoyment. It is impossible, I repeat, to estimate the influence of such an institution on the minds of the working-classes. How many hours once wasted may now be profitably dedicated to pursuits in which interest was first awakened by some accidental display in the Norwood palace; how many constitutions, almost broken, may be restored by the healthy temptation into the country air,—how many intellects, once dormant, may be roused into activity within the crystal walls, and how these noble results may go on multiplying and increasing, and bearing fruit seventy times seven-fold, as the nation pursues its career,—are questions as full of hope as incapable of calculation. But with all these grounds for hope there are others for despondency, giving rise to a group of melancholy thoughts, of which I can neither repress the importunity nor forbear the expression.

For three hundred years, the art of architecture has been the subject of the most curious investigation; its principles have been discussed with all earnestness and acuteness; its models in all countries and of all ages have been examined with scrupulous care, and imitated with unsparing expenditure. And of all this refinement of inquiry,—this lofty search after the ideal,—this subtlety of investigation and sumptuousness of practice,—the great result, the admirable and long-expected conclusion is, that in the centre of the 19th century, we suppose ourselves to have invented a new style of architecture, when we have magnified a conservatory!

In Mr. Laing's speech, at the opening of the palace, he declares that "*an entirely novel order of architecture*, producing, by means of unrivalled mechanical ingenuity, the most marvellous and beautiful effects, sprang into existence to provide a building."* In these words, the speaker is not merely giving utterance to his own feelings. He is expressing the popular view of the facts, nor that a view merely popular, but one which has been encouraged by nearly all the professors of art of our time.

It is to this, then, that our Doric and Palladian pride is at last reduced! We have vaunted the divinity of the Greek ideal—we have plumed ourselves on the purity of our Italian taste—we have cast our whole

* See the *Times* of Monday, June 12th.

souls into the proportions of pillars, and the relations of orders—and behold the end! Our taste, thus exalted and disciplined, is dazzled by the lustre of a few rows of panes of glass; and the first principles of architectural sublimity, so far sought, are found all the while to have consisted merely in sparkling and in space.

Let it not be thought that I would depreciate (were it possible to depreciate) the mechanical ingenuity which has been displayed in the erection of the Crystal Palace, or that I underrate the effect which its vastness may continue to produce on the popular imagination. But mechanical ingenuity is *not* the essence either of painting or architecture; and largeness of dimension does not necessarily involve nobleness of design. There is assuredly as much ingenuity required to build a screw frigate, or a tubular bridge, as a hall of glass; all these are works characteristic of the age; and all, in their several ways, deserve our highest admiration; but not admiration of the kind that is rendered to poetry or to art. We may cover the German Ocean with frigates, and bridge the Bristol Channel with iron, and roof the county of Middlesex with crystal, and yet not possess one Milton, or Michael Angelo.

Well, it may be replied, we need our bridges, and have pleasure in our palaces; but we do not want Miltons, nor Michael Angelos.

Truly, it seems so; for, in the year in which the first Crystal Palace was built, there died among us a man whose name, in after ages, will stand with those of the great of all time. Dying, he bequeathed to the nation the whole mass of his most cherished works; and for these three years, while we have been building this colossal receptacle for casts and copies of the art of other nations, these works of our own greatest painter have been left to decay in a dark room near Cavendish-square, under the custody of an aged servant.

This is quite natural. But it is also memorable.

There is another interesting fact connected with the history of the Crystal Palace as it bears on that of the art of Europe, namely, that in the year 1851, when all that glittering roof was built, in order to exhibit the petty arts of our fashionable luxury—the carved bedsteads of Vienna, and glued toys of Switzerland, and gay jewellery of France—in that very year, I say, the greatest pictures of the Venetian masters were rotting at Venice in the rain, for want of roof to cover them, with holes made by cannon shot through their canvas.

There is another fact, however, more curious than either of these, which will hereafter be connected with the history of the palace now in building; namely, that at the very period when Europe is congratulated on the invention of a new style of architecture, because fourteen acres of ground have been covered with glass, the greatest examples in existence of true and noble Christian architecture were being resolutely destroyed; and destroyed by the effects of the very interest which was slowly beginning to be excited by them.—*Ruskin.*

## SEPARATING SILVER FROM LEAD.

At the last annual gathering of the Royal Cornwall Polytechnic Society, Mr. J. A. Phillips, of London, at the request of the chairman, addressed to the Society some observations, in which he stated that one of the most important improvements which had recently been made in the metallurgical art came into operation last year, and is the separation of silver from lead by means of zinc. After describing the old process of separation, and the subsequent process discovered by Mr. Pattinson, of Newcastle-on-Tyne, involving several crystallizations and a final cupellation; he stated that still more recently a patent had been taken out by Mr. Parkes for a process by which he separates the silver entirely by one operation. To do this, the alloy of silver and lead is melted in the usual way in a large iron pot. To this a small quantity, a few pounds of zinc per ton, is added, the whole mixed up and allowed to remain a short time. By this means the silver is brought to the surface in the form of alloy with the zinc, and this mixture is subsequently skimmed off and treated for the silver it contains. In order to do this the zinc is first partially separated by oxidation, and the residual alloys afterwards treated in the cupel. In connection with the purification of metals, he might mention some of his own experiments in regard to tin. The tin from Peru and some other countries contains a large amount of tungsten, or wolfram, which very much depreciates its value. Till recently this tin could only be employed for very common purposes, such as making tin pipes and other things, which did not require tin of good quality. But in analysing some of this tin he happened to discover a process by which the separation was very easily effected, and this process has been recently patented. It consists in taking impure tin, containing from 5 to 10 per cent. of tungsten (worth 25*l.* per ton less than tin of ordinary purity), granulating it by melting it in a reverberatory furnace, and allowing it to flow into a vessel containing water. This granulated tin is then placed in a pan with common hydrochloric acid, which may be obtained

from the soda manufacturers at almost a nominal price. This being heated, hydrogen gas is evolved, and a solution of chloride of tin is obtained. In this operation it is necessary the tin should be present in excess; unless it be so a certain portion of tungsten is dissolved. Should, however, the operation be carried on too far, and a portion of tungsten be dissolved, the addition of a small quantity of impure tin precipitates the tungsten, and chloride of tin, free from tungsten, is obtained. This is turned off into a vat, in which more granulated impure tin is placed, and any arsenic or antimony remaining is there deposited, and a pure solution of chloride of tin is obtained. From this we have to get the chemically pure tin we require, and which is quite as good as the stream tin of Cornwall Into this bath we put bars of metallic zinc, which precipitate the tin in a spongy mass, when instead of chloride of tin we get chloride of zinc. The tin thus produced may be fused into bars, or sold as the best tin. The chloride of zinc must be so used as to lower the expense of the whole process. To do this it is precipitated by milk of lime, or common chalk; we then get oxide of zinc, which is largely used as a pigment; and to give it sufficient opaqueness for that purpose, the washed oxide of zinc is heated to redness, when it is found to be equal to the ordinary oxide of zinc obtained by sublimation.

## LIGHTNING CONDUCTORS FOR SHIPS.

BY R. B. FORBES, OF BOSTON.

I have long considered a good lightning conductor for ships a great desideratum, and have employed a good deal of my spare time and money in endeavouring to introduce into our navy, and into our mercantile marine, the conductor of Sir William Snow Harris, which, in the British navy, in the Honourable East India Company's service, and in some of the other navies of Europe, has been adopted; every ship in the British navy has Harris's conductor, and not a pound sterling nor a single life has been lost by lightning since it has been fully adopted. This is a fact which speaks to the humane as well as to that no smaller class who look solely to their own interest.

The Harris Conductor has not been used in our navy principally because "there is no appreciation in the navy department for the purchase of a patent right," and it has not been introduced into our mercantile marine because it is too costly.

With a view of bringing into use the same principles at a smaller cost, I turned my attention to a modification of Harris's conductor, and have obtained a patent for it, as you know. My improvement or modification is approved by Sir William S. Harris.

It consists simply in leaving the masts at or near to the eyes of the lower rigging, and coming down by one of the shrouds on each side, by a system of tubes and sockets in connection with a conductor fixed to the side of the ship. By this process the interior of the ship is avoided, and a simple yet fixed conductor is applied, by which the electric fluid is carried off; a ship can be fitted as well afloat as on the stocks, and as well loaded as when empty, and the moderate cost brings it within the range of the *general ideas* of shipowners.

The usual chain or link conductor used in the navy, and in some merchant ships, is good *as far as it goes*, but being very liable to derangement, by reason of the strains and jerks to which it is subject, it is not generally adopted, and does not meet the requirements of a permanent conductor. A copper wire of 1 1-6 of an inch in diameter, is good as far as it goes too, and the same may be said of a wire no larger than a piece of twine, or not larger than sewing silk. A small wire will carry off a small discharge of electricity harmlessly to the mast and ship, but it will fuse in the operation, leaving the mast unprotected. Now, it is desirable to have a conductor permanently fixed to, and incorporated with, the masts and hull of a ship, so that a heavy discharge will be as easily carried off as a small one by a small wire. The conductor which I have patented will do this if it has sufficient surface, and is thoroughly fitted.

I am now only waiting until I can make suitable arrangements with some well-known concern engaged in the manufacture of copper, for the purpose of supplying ships with fixed and reliable conductors, which, if generally adopted, will save many lives and much property.

The underwriters of New York have agreed to make a return of two per cent. of the premium on all ships furnished with suitable lightning conductors; they show a regard for the cause of humanity and for their own interests by making this return; and it is to be hoped that all underwriters will follow this good example. Not that it is the duty of underwriters to encourage these means more than shipowners, but the concession will have the effect to wake up the owners of ships to a sense of their duty in this respect.—*Scientific American*.

## AVERY'S SEWING MACHINE.

"We have received information," says the *Scientific American*, "from our foreign corre-

spondent, that the Emperor of France has purchased the French patent of Avery's American Sewing Machine for 95,000f. The inventor, Dr. Avery, had an interview recently with the Emperor, surrounded by his ministers, at the Palace of St. Cloud, and he exhibited his machine amidst the plaudits of the court. Louis Napoleon is a man of profound penetration; he can see into the merits and demerits of men and things with great rapidity, and he has displayed no small amount of sagacity in cultivating the good will of America by the purchase of the above-named patent."

## THE "ERICSSON" TRANSFORMED TO A STEAMER.

"It is creditably reported in our city," says a New York paper, "that the repairs which have been quietly making in this vessel for some time, have for their object the employment of steam as the motive agent; the *hot-air* project having been returned *non est inventus*. Thus it is, 'wonders will never cease;' for this agent, after having extinguished Watt and Fulton through the medium of some of our very scientific cotemporaries, for a brief and intoxicating period last year, has at last 'fallen, fallen, fallen from its high estate,' and bowed the knee to the grey-haired veteran in mechanism—steam.

"This information we have received from more than one source, and as we have been unjustly the subject of much vituperation, for the candid views we expressed in reference to the affair, we will take occasion, at an early opportunity, of alluding to the subject at greater length."

## HUGHES'S ORNAMENTING VELVET PATENT.—LAW CASE.

GUILDFORD, AUGUST 14.

(*Before the Lord Chief Baron and a Special Jury.*)

HUGHES *v.* ROGERSON.

Counsels for the plaintiff, Mr. Bramwell and Mr. Wordsworth; for the defendant, Mr. Sergeant Channell and Mr. Bovill; attorneys for the plaintiff, Messrs. Walcot, Lloyd, and Chevallier, of Serle-street, Lincoln's-inn; for the defendant, Mr. Blair, of Manchester.

The plaintiff is an embossed-velvet trimming manufacturer, of No. 87, Aldersgate-street, City, and the defendant, an embosser, &c., of Manchester.

This was an action for the infringement of the plaintiff's patent for "An improved method of producing cut and fancy patterns in velvet, silks, and other textile fabrics," dated August 13th, 1853, and described in *Mechanics' Magazine*, Volume 60, page 208.

It appeared that the plaintiff's invention consisted in ornamenting velvet and other fabrics by embossing and cutting the fabric to be operated upon simultaneously and by the same machine, the apparatus being both simple and complete.

On the case being called on, it was ultimately agreed, with the entire approbation of the learned Judge, that a verdict should be given for the plaintiff for 10*l.*, with the understanding that a license should be granted to the defendants on certain terms to be agreed upon, and the learned Chief Baron readily granted a certificate to the plaintiff, establishing his right to the patent.

*The True Principle of the Law of Storms, practically arranged for both Hemispheres.* By James Sedgwick, formerly of the Hon. East India Company's Service, and many years Master of Ships in the India Trade. Fourth Edition. London: J. D. Potter, Poultry, Agent for Admiralty Charts. 1854.

We regret that this handbook did not reach us earlier, since it is of very considerable importance to navigators, and deserves to be generally circulated throughout the royal and mercantile navies.

Notwithstanding the extensive researches that have recently been made in order to increase and regulate our knowledge concerning the laws of storms, it is very well known that mariners still stood in need of plain directions, by following which they might escape the vortex of a hurricane, the outer circles of which had overtaken them. This fact appears to have powerfully impressed the author during a detention he experienced at the Mauritius, in December, 1851, when about twenty vessels put in, more or less dismasted, from which immense quantities of damaged cargo were landed, after bales of silk, indigo, shell-lac, &c., had been thrown overboard, to make way for getting at the weightier portion of the cargoes during the hurricane that prevailed. "The ships that put in at the Mauritius were all, I believe," says the author, "first-class; and if the severe shaking they received be any criterion as to the violence of the storm, heaven only knows what became of our red diphthongs and second-class vessels." He adds, "I heard on this, as on similar occasions, many theories advanced on the Law of Storms, but none that in any way defined the true

principle. The general opinion seemed to be, that the hurricane had caught the ships on its *recurve*, but none could tell exactly how the masters of these vessels were to know when the hurricane had *recurved;* and it seemed to me, that for want of this knowledge the mere theory of the Law of Storms would be of little practical use. Again and again did this subject recur to my mind, and during my voyage homeward, my attention was constantly directed to the matter, which the recent disasters at the Mauritius had invested with additional interest."

Captain Sedgwick assumes the truth of the Law of Storms already laid down, viz., that they revolve in circles about centres which have a motion from east to west, curving to the southward and south-east in the southern hemisphere, and to the northward and north-east in the northern hemisphere, and that the velocity of rotation of the wind increases as the centre or vortex of the storm is approached; and upon this assumption he proceeds to give directions for determining approximately the path of the hurricane, so that the vortex of it may be avoided. He commences with the southern hemisphere, and supposes himself either outward or homeward bound from India, when the weather is threatening, the barometer falling, and other indications of a coming storm are apparent. Now, since the wind moves in circles about the vortex, it is evident *that at all times* the vortex lies in a line at right angles to the direction of the wind; and this fact combined with another, viz., that in that hemisphere the hurricane rotates from left to right (the observer standing with his back to the centre), enables him to determine at once the true bearing of the vortex; so that if the wind is at the south, he at once concludes that the centre of the storm bears east. Having settled this point, he next carefully observes the way in which the wind veers, in order to ascertain whether the ship "is in the right or left hand semicircle of the storm's course,"* calling that the right, which is on the right hand when looking towards the *probable* track of the hurricane; or, which is the same thing, when the back of the person is turned to that quarter where the centre of the hurricane bears, when the wind is first observed.

If the first shift of wind now occur to the eastward, he concludes that he is in the left-hand semicircle, and therefore brings his ship to the wind on the port tack, so that as the wind comes round, the vessel will bow the sea; but if the wind shifts to the westward, he then knows that he is in the right-hand semicircle, and consequently, scuds away to the northward.

"Similar results should follow with the wind at S. by E.; SS.E.; S.E. by S.; S.E.; S.E. by E.; E.S.E.; E. by S., and East; with the wind at E. by N. the centre of the hurricane will bear N. by W.; and whether it has commenced its recurve or not, if the wind shift to the northward, it shows that we are in the left-hand semicircle, and that the ship ought to be on the port tack; but if the wind shift to the southward, it shows that we are in the right-hand semicircle, and ought to run to the westward; the same result follows with the wind commencing at E.N.E.; N.E. by E., and N.E."

To make the subject more plain, the author supplies full directions, showing how to act with a certain wind. For instance, "if the wind is at S.E., the centre of the storm bears N.E., but it is impossible to tell in what direction it may be travelling. Let us suppose that the first shift of wind takes place to the southward, we know then that we are in the right-hand semicircle, and it may be travelling SS.W. or SS.E. of our position; for it is evident that it cannot be travelling to the northward of our position, otherwise the wind would have shifted to the eastward of S.E.; had it done so, the ship ought to have been brought to the wind on the port tack; and in order to avoid getting too close to the vortex of the hurricane, it would be desirable to run to the S.E.; but the wind being from that quarter, renders it impossible for us to do so, and all that can be done is to make the ship as snug as possible, by getting top gallant masts on deck, preventer gaskets on yards, &c. In short, everything should be done that the prudent seaman considers necessary at such a time; this will probably save the masts, for on such occasions it is not in our power to say how far the vortex may pass clear of the vessel."

But in order to ascertain more precisely the path of the hurricane, it is necessary to form diagrams or projections, representing the position of the vessel and the storm, at intervals of time. We shall extract two or three examples of this process given by Captain Sedgwick, which will be readily understood by those of our readers who are familiar with geometrical illustrations. They are arranged for the southern hemisphere, and are introduced by the author thus:

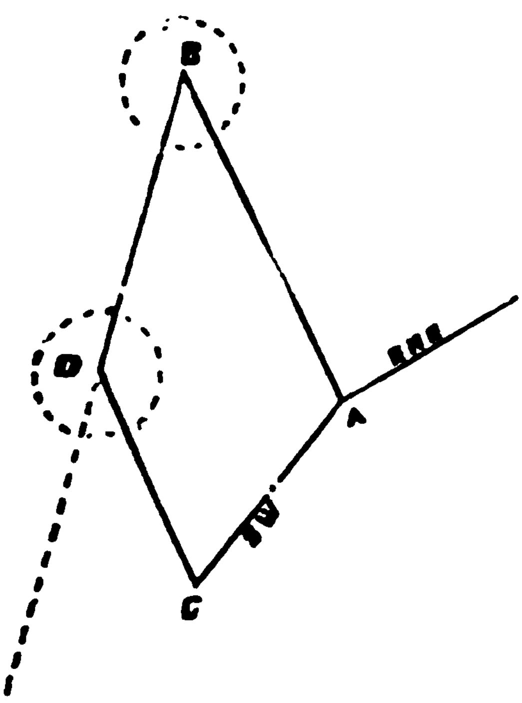
"It has appeared to me useful to give a few projections, which are so simple that, let a man's mind be ever so much harassed at the

* We do not approve of this expression, since it does not accurately express what the author intends to convey. What is evidently meant is, "the right or left hand of the two semicircles into which the path of the hurricane's centre divides the circle which the wind describes about that centre."

idea of getting near the vortex of a hurricane, he will still find time to go below for five minutes, and construct one. In this way he will be enabled, when any shift of wind takes place, to ascertain in which semicircle of the storm he is, and will give some degree of certainty to the opinion he forms as to its probable course.

"Fig. 1 shows a ship at A, with the wind

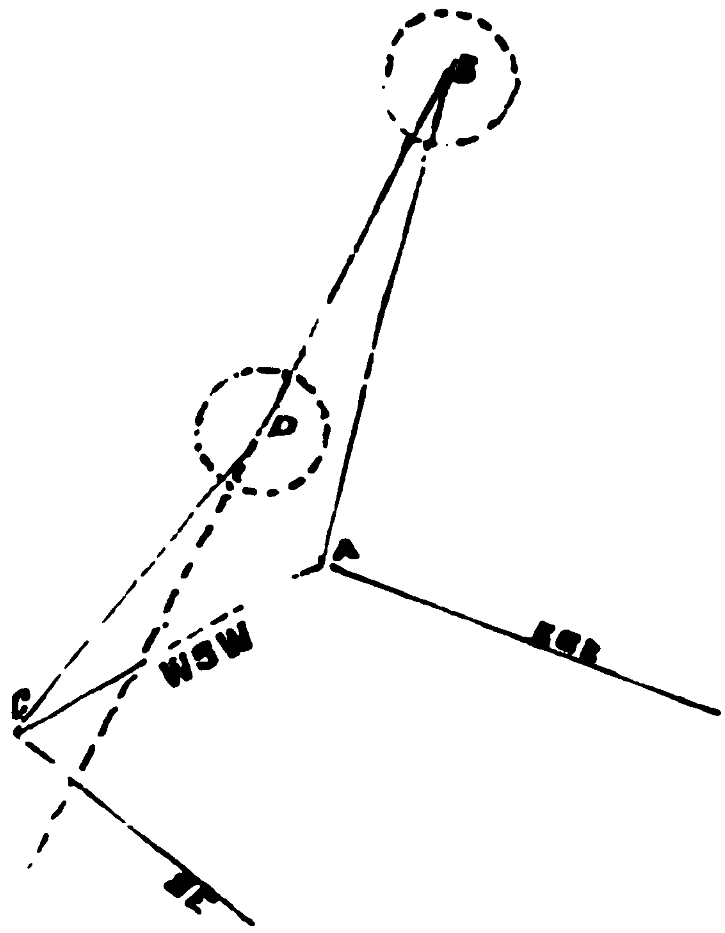
Fig. 1.



at E.N.E., consequently the centre of the storm bears NN.W.; and as the lowest computation that can be given with reference to the distance of the ship, from the centre of the storm, when she is enabled to run under single-reefed topsails, is 100 miles (or better still, it may be 150), a line drawn from where the ship is, to the NN.W. quarter, and 100 miles marked off, to B, shows the nucleus of one of the most unpleasant things a man can well fall in with at sea. Suppose the ship to be running S.W., and going rapidly through the water, say ten knots an hour, in six hours she will have run sixty miles; now, mark off sixty miles on a S.W. course; this brings the ship to C; during these six hours we must allow the hurricane to have travelled also, and as it is blowing harder, but still in the same quarter, the vortex of the hurricane must be nearer to us; we may call it twenty, forty, or sixty miles nearer; say forty miles, which taken from the first distance of 100 miles, leaves sixty miles, and as the wind is the same, the vortex of the hurricane must bear the same, but it is only sixty miles off; now lay off sixty miles from the second position of the ship at C, on a NN.W. line, which will reach to D; a line drawn from the two points of the bearing of the storm's centre, B D, shows the course of the hurricane to be about S. by W. three-quarters W.; and consequently the ship is running right across its track. There is still time to avoid it, if the vessel's head be put to the S.E.; but a very heavy brush of its tail will be felt in consequence of running so long.

"Fig. 2 shows a ship at A, the wind at

Fig. 2.

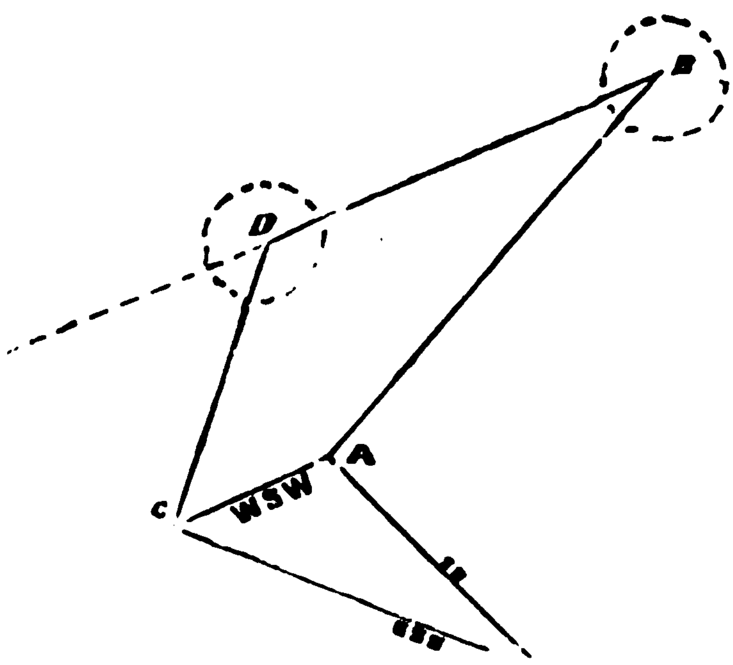



E.S.E.; consequently the centre of the hurricane bears NN.E., and the same distance is assumed, namely 100 miles at B. (It matters little whether we call the distance 100 or 200 miles, the result will be the same.) Let us now suppose the ship to have sailed W.S.W. sixty miles to C, and we then find the wind has shifted to S.E., consequently at the point, C, the centre of the hurricane must bear N.E.; and as the wind is now much stronger, we will say the distance is only sixty miles; a line from C to the second bearing of the centre of the storm, and sixty miles marked off, shows the centre at D. Another line from the two bearings, B D (carried on), gives the probable course of the hurricane a little to the westward of S.W. by S., and it will be perceived that the ship has run into a very dangerous position, although she has got into the right-hand semicircle, as the veering of the wind as well as the projection indicate. Now, to continue on this course would be wrong, for although you might escape the vortex, it would pass so near that the loss of a few spars seems inevitable; consequently the ship's head should be put at right angles to the storm's course, namely, N.W. by W.

"Fig. 3 shows a ship at A, the wind S.E., with the centre of the storm bearing N.E., the same distance off, namely 100 miles at B. Suppose the ship to have sailed W.S.W. sixty miles, this places her at C; but instead of the wind shifting two points to the

southward, as in the former projection, it has shifted two points to the eastward, and is now E.S.E.; the centre of the hurricane will bear NN.E., and as the wind has increased, it must be nearer, say only sixty miles off; this gives the centre of the hurricane at D, and a line drawn from B to D shows the probable course of the hurricane;

Fig. 3.




and that if the ship is edged away to the southward, the centre of the storm will soon pass, and the course may be again resumed.

"It will be seen that projections are of great utility when the distance run by the ship, after the first bearing of the storm has been taken, is considerable, especially if the wind continues in the same quarter, as one naturally feels very anxious to know on which side of the storm's track he is.

"From the full, and at the same time concise instructions (proceeds the author), I have endeavoured to give for the guidance of those who may be exposed to the chance of a hurricane in the Southern hemisphere, I feel that there will be little difficulty in carrying out the same views with reference to the northern hemisphere, where they rage with equal violence in the Bay of Bengal and West Indies, and under the name of typhoons in the China Sea.

"It is a well-attested fact, that the rotatory motion of the wind in hurricanes, in the northern hemisphere, is exactly the reverse of what it is in the southern hemisphere, as it blows in circles from right to left, or, as sailors term it, goes round left-handed; but at the same time, the vortex of a hurricane will always be at right angles to the wind in either hemisphere, blow from what quarter it may.

"The track of storms in the northern hemisphere appears to be similar to the track pursued by those in the southern hemisphere, coming from the east; but, instead of curving to the southward and S.E., they curve to the northward and N.E. With these few preliminary remarks, I will proceed to give instructions to avoid the vortex of a storm in the northern hemisphere.

"If a hurricane be threatening, with the wind at north, the vortex must bear east, and as it is equally as impossible in the northern as in the southern hemisphere to tell immediately the direction the storm is taking, we must carefully observe the way the wind veers; if the first shift of wind occur to the eastward, it shows the hurricane to be travelling to the southward of our position, and that we are in the right-hand semicircle; consequently, as we cannot run to the northward, we must lay-to on the starboard-tack; but if the shift of wind be to the westward, it shows the hurricane to be travelling to the northward of our position; and, as we are in the left-hand semicircle, we can run to the southward, so as to get well clear of the vortex.

"I will give a case which will answer either for the Bay of Bengal, China Sea, or West Indies. Suppose a ship to be entering the range of a hurricane with the wind at N.E., it follows that the centre will bear S.E., and if those in charge of the vessel persist in running down the Bay of Bengal or China Sea, without first ascertaining if they are in the right or left-hand semicircle, it is very probable they may get overwhelmed in the vortex. As the loss of four, five, or six hours is very trifling, or as the result may show the delay to be a gain, I think none but a madman would neglect rounding-to, for the purpose of ascertaining whether he was in the left or right-hand semicircle of the storm's track, and having taken this precaution let him round-to on the starboard tack. If the wind now veer to the eastward of N.E., he may rest satisfied with his position, and feel assured he will escape the vortex, as he is in the right-hand semicircle; but he should be prepared for a heavy gale. If the wind should shift to the northward of N.E., it shows that he is in the left-hand semicircle of the storm's track, and may run to the S.W. But if, after laying-to a considerable time, no shift of wind occurs, he may be certain that he is nearly, if not quite, in the track of the vortex, and ought to run S.W. At the same time it must be admitted that there is always some danger in this proceeding, although with the choice of two evils, this is the least, since by running at right angles to the storm's track, the vortex may be avoided. But by laying-to, even under bare poles, and top-gallant masts struck, it may disable the finest ship ever launched."

In concluding his work the author says: —"It is well ascertained that the wind in hurricanes blows in circles in both hemi-

spheres; and whether the general track laid down in this treatise is quite correct or not, the practical plan now shown, which supersedes the use of the hurricane card, and the necessity for assuming a track, will enable the mariner to ascertain how the nucleus of his enemy bears from him; and the plain directions which I have given will also tell him how to act. In the event of a deviation in the course taken by the hurricane, let him only keep his back to the vortex, which must always be at right angles to the wind, and any changes that may occur will soon tell him if the storm is coming towards, or going from him. It will be seen by the foregoing remarks how unnecessary it would have been for me to have extended this treatise, by showing the mariner how to act with the wind having westing in it; and I feel certain there will be little difficulty in comprehending the subject I have endeavoured to illustrate; a little attention will soon enable any one to form a correct idea of how he must act in the dangerous quadrant, and in all places of difficulty, where a deviation from the general track of the storm takes place.

"Attempts have been made to show that all gales of wind are moving in circles. This will not bear the test of practical experience: for instance, off the Cape, one man says, 'When bound to Australia, running our easting in a heavy gale from the west, the wind increased so much, that the ship was hove-to for the centre to pass, and it was very evident when this took place; afterwards bore up, the weather more moderate, but wind in the same quarter.' Now, how can the gale of wind have been a circular storm, if the wind continued from the same quarter after the centre had passed?

"Another man attempts to prove an analogy between the Indian hurricanes and the north-westers and south-easters off the Cape; but it so happens that the north-westers blow when there are no hurricanes in the southern hemisphere; and even if it were not so, the north-westers off the Cape in winter are too frequent for them all to belong to the Indian hurricane, as only two or three occur in those seas during the year. Ships are frequently three or four weeks in getting from abreast of Algoa-bay to Table-bay,—strange perversity this of the hurricane,—it ought to move on and not be continually coming back to annoy the homeward-bounders; and, moreover, north-westers off the Cape rarely chop to the S.W., except in summer time; if their doing so could be depended upon in the least, ships would only have to get a good offing with the N.W. wind to make a fair wind of S.W.

"With regard to south-easters off the Cape,—those sweet little indulgences to homeward-bounders,—seamen can never consent to their being classed with the rude hurricane: they seldom blow with much violence, and sometimes last for a week at a time; and although they may be an annoyance to the Cape burghers,—blowing with a pertinacity over their devoted heads, instead of progressing onwards as well-behaved hurricanes should do,—still the said burghers would rise in arms if their health-producing and ship-introducing wind were classed with the devastating hurricane.

"Gales of wind in high latitudes are mere squalls, compared to the wind experienced near the vortex of an Indian hurricane; and although storms which, from their very violence, may partake of the nature of the hurricane, have been felt in high latitudes, they are of rare occurrence; but perhaps further research may prove this opinion to be incorrect, and I only mention it that we may not jump to conclusions too hastily."

We are gratified to find that Captain Sedgwick's valuable little work is already largely distributed throughout the mercantile navy; and we believe that if it is not yet supplied to the officers of Her Majesty's ships in commission, the fact is to be attributed to that obstructive spirit which is well known to characterize the Naval administrators of this country.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Garrett, Richard, of Leiston-works, near Saxmundham, Suffolk. *Improvements in thrashing-machines.* Patent dated January 30, 1854. (No. 226.)

The inventor says, "The first part of my invention is, to apply the power to drive the parts of a thrashing-machine which require slower motion than the drum, and then to the axis of the drum, by which means the prejudicial result consequent on getting all the power up to the high velocity requisite for the drum, and then bringing the velocity down from the parts requiring slower motions is avoided." He also gives a double motion to the shakers by means of cranks and rocking-bars.

Kershaw, John, of Dublin, Ireland, engineer. *Improvements in steam engines.* Patent dated January 30, 1854. (No. 227.)

This invention relates to the heating of the feed-water previous to its entering the boiler, and consists in the employment of an iron chamber placed behind or in front of the fire-box, or in any other convenient position, along the top of which chamber is fitted a pipe perforated on its underside with small holes, &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture or production of gas, and in the application of the material employed therein.* (A communication.) Patent dated January 30, 1854. (No. 228.)

This invention mainly consists in the production of gas either for lighting or heating purposes, from turf, wood, tar, and the waste or refuse of various vegetable substances, such as cotton, paper, chips, and saw-dust.

CHAPMAN, ROBERT, of Eaton, Norwich, miller. *An apparatus for regulating the feed to millstones.* Patent dated January 30, 1854. (No. 229.)

This apparatus is constructed on the principle of the ordinary centrifugal ball-governor used in steam engines, and acts on a valve placed in the hopper which supplies the grain to the millstones, in a manner analogous to the action of the steam engine governor on the throttle-valve.

FATIO, ARNOLD MOREL, merchant, and FRANCOIS VERDEIL, medical doctor and chemist, both of Paris, France. *Improvements in preserving animal and vegetable substances.* Patent dated January 31, 1854. (No. 231.)

These improvements consist in preserving animal and vegetable substances, by first steaming them for the purpose of coagulating the albumen, partially cooking the substances, and afterwards drying them for the purpose of driving off the watery particles from them.

TURNER, EDWARD WILLIAM KEMBLE, of Praed - street, Paddington Middlesex. *Treating gold and other ores.* Patent dated January 31, 1854. (No. 232.)

This invention consists in employing as a crusher a "wedge - shaped, or triangular prismoid," faced with the segment of a sphere; and in straining the amalgam by what the inventor denominates the "Vacuum process."

HOLLINGSWORTH, THOMAS, of Nottingham. *Improvements in forming or applying tags to laces.* Patent dated January 31, 1854. (No. 233.)

These improvements consist in forming the tags of laces of gutta percha, or a similar plastic material, by dipping the ends of the laces in such materials dissolved or softened, and then moulding into tags those portions of the soft material which adhere to them.

YOUNG, LUTHER, of Bow-lane, Cheapside, and EDWIN MARTEN, of Louisa-street, Stepney. *Improvements in apparatus for regulating the pressure and supply of gas.* Patent dated January 31, 1854. (No. 234.)

The patentee describes apparatus in which a valve is suspended to the shorter-arm of a lever, and caused to close or open the passage by which the gas is supplied; the other arm of the lever is connected by a rod to an inverted vessel which dips into water or other fluid, this vessel being made to float by means of one or more floats placed in a tube or tubes containing quicksilver, and the necessary pressure is obtained by means of a weight applied to the inverted vessel.

HAZLEHURST, ISAAC, of Ulverstone, Lancaster, iron and steel manufacturer. *Improvements in the manufacture of iron by blast, and in the construction of furnaces and machinery for the same.* Patent dated January 31, 1854. (No. 236.)

The inventor claims a certain described method of manufacturing iron by blast,—the construction of furnaces with circular bottoms for the purpose,—the construction of certain puddling tools,—the application of the blast by a quadron or T-pipe, &c.

KOEFFLER, LOUIS CHRISTIAN, of Rochdale, Lancaster, bleacher and dyer. *Certain improvements in machinery or apparatus for preparing, dressing, and finishing yarns or threads.* Patent dated January 31, 1854. (No. 238.)

*Claims.*—1. Passing the yarn or thread between two or more friction surfaces, the one or both being heated by steam or by other means. 2. Imparting to the material a transverse motion by means of rods or rollers, with which it passes in contact. 3. A general arrangement and combination of machinery, as described.

KOEFFLER, LOUIS CHRISTIAN, of Rochdale, Lancaster, bleacher and dyer. *Certain improvements in the method or process of scouring, washing, and oiling wool, and other textile materials, for the purpose of spinning, and in the machinery or apparatus connected therewith.* Patent dated January 31, 1854. (No. 239.)

This invention comprises the employment of air or steam pressure for forcing the fluids into and through the materials to be operated upon—in returning the scouring liquor, when used, to the source from whence it was drawn by air or steam pressure, that it may be used—again applying oil or its equivalent to wool or other materials, by causing it to displace water, which is combined with the material,—and a method of conducting the several processes of scouring, washing, and oiling, or oiling, and one of the others, in one vessel, without removing the material.

WRIGHT, WILLIAM, and GEORGE BROWN, of the firm of Wright and Brown, of Newcastle-upon-Tyne, iron-rounders. *Improvements in cupolas, which improvements are also applicable to smelting and other furnaces.* Patent dated January 31, 1854. (No. 240.)

*Claims.*—1. "The general arrangement and construction of cupolas and smelting furnaces for the self-heating of the air-blast, as hereinbefore described. 2. The application and use in cupolas, smelting, and other furnaces, of receiving-chambers or sections for the reception of the metal or mass of material under treatment to form heating-surface for the air-blast. 3. The system or mode of heating the air-blast of cupolas and furnaces by passing the air over the surface of, or in contact with the melted or heated mass of material as brought down from the cupola or furnace body. 4. The system or mode of working furnaces, wherein the air is first passed through the fire or through the body materials of the furnace, and then through furnace heating-chambers, or in contact with the heated metal or metals brought down from the furnace body."

Meeus, Pierre Joseph, of Paris, France, engineer. *Improvements in producing metallic surfaces.* Patent dated January 31, 1854. (No. 241.)

*Claim.*—Gilding and coating with metals, by means of heat and pressure, articles composed of or coated with gums, gutta percha, caoutchouc, or mixtures or combinations of these or analogous substances; also certain methods of imitating embroidery and embossed or figured goods, of all descriptions, on yielding fabrics and bodies, and the production of ribbons, trimmings, braid, gold or silver lace, fringes, and articles of a similar description, in gold, silver, platinum, or other metals, either plain, coloured, tinted, or shaded, so as to resemble mother-of-pearl or otherwise.

Malam, William, of Blackfriars-road, Surrey, gas-engineer. *Improvements in apparatus for the manufacture and holding of gas.* Patent dated January 31, 1854. (No. 242.)

A full description of this invention forms the first article of this Number.

Brooman, Richard Archibald, of 166, Fleet-street, London, patent agent. *Improvements in the manufacture of steel.* (A communication.) Patent dated January 31, 1854. (No. 243.)

*Claims.*—1. "The employment of yellow and white heat instead of cherry-red heat in the manufacture of steel in reverberatory furnaces. 2. The addition to the metal in fusion of a powder, for softening and purifying the metal."

Jackson, James, of Broad-street, Golden-square, Middlesex, and George Morris Hautler, of Sloane-street, Middlesex. *Improvements in baths.* Patent dated January 31, 1854. (No. 245.)

These improvements in baths consist in forming them with the bottom on different levels, that on which the feet rests being lowest, while the other part is at a sufficient height from it to form a comfortable seat for the bather.

Chenot, Claude Bernard Adrien, of Paris, Boulevart St. Martin, France. *Improvements in accumulating, conducting, and treating gases of combustion, and also in generating and applying the same to metallurgic and other purposes.* Patent dated February 1, 1854. (No. 246.)

"The ends of my improvements," says the patentee, "are, to impart to gases a constant richness, and also a threefold calorific, chemical, and mechanical action. The first of these ends is attained by subjecting gases to normalization, which produces a constantly rich gas, shut up under gas-meters, from whence it is supplied. Next, decantation of gas constitutes a novel means of enriching gas, giving rise to a variety of applications in practice; generating gases under the influence of carbonates doubles their calorific power, the revivification of carbonates renders said carbonates useful in every respect, generating gases by pulverulent feet under the influence of steam or gases, such as carbonic acid imparts to the gases generated an absolute richness for burning; hence the above operations form a complete series of practical means for enriching gas, and producing the highest degrees of heat, as well as the most energetic oxydising and reducing actions. Having thus obtained the calorfic and chemical action, there is only the mechanical action left. This latter is insured by burning gases which are being mixed with the air at the moment of the combustion, without any previous mixture with air, which would be dangerous and incomplete. This mixture is instantaneously accomplished by moving the tuyer, which changes the oxidizing action into a reducing one, so that by an easy mechanical action the chemical one is obtained. The mechanical action is completed by the gases being projected with a great pressure, and thus acting like the tools which are used for producing reactions by stirring or agitating in common practice."

Wickens, Henry, of Tokenhouse-yard, London, gentleman. *Improvements in the mode of intercommunication in railway trains.* Patent dated February 1, 1854. (No. 247.)

These improvements consist in the use of speaking-tubes made of gutta percha, metal, or other suitable material, and carried along the carriages of a railway train.

Burgum, John, of Birmingham, Warwick, engineer. *A new or improved self-acting damper for the furnaces of steam boilers.* Patent dated February 1, 1854. (No. 250.)

This invention consists in constructing a self-acting damper for the furnaces of steam boilers by connecting the ordinary damper

with a float, which is raised by means of water forced by the pressure of the steam into the tube containing the float.

GUEST, WILLIAM, of Lion-square, Sneinton, Nottingham. *Improvements in machinery for making whips, parts of which improvements are also applicable to the manufacture of braids and wire nets.* Patent dated February 1, 1854. (No. 251.)

These improvements mainly relate to an improved spindle, and arrangement of the spindle used in braiding machinery for making whips, and consist in reducing the number of holes requiring to be threaded—in simplifying the act of threading—in arranging the bobbins and weights, so as to rise and fall together—in adding extra pairs of spindles, so arranged as to be brought into and out of action, according to the description of work performed—in arranging the spindle with the bobbin stationary and the weights or threads so as to work outside the spindle—and in applying the improved spindle to the manufacture of braids and wire nets.

ROBINSON, ALFRED, of Whitehall-place. *Improvements in preparing compositions for coating iron and other ships' bottoms and other surfaces.* Patent dated Feb. 1, 1854. (No. 253.)

*Claim.*—Combining plumbago (with or without poisoning or irritating matters), "with asphaltum, pitch, or other similar matter, requiring heat or a solvent and heat to render it fluid, for the purpose of mixing and applying plumbago to the covering the bottoms of ships or vessels, and other surfaces."

JOBSON, JOHN, of Litchurch Works, near Derby, ironfounder, and ROBERT JOBSON, of Holyhall Works, near Dudley, Staffordshire, iron-founder. *Improvements in the manufacture of moulds for casting metals.* Patent dated February 1, 1854. (No. 255.)

*Claim.*—The manufacture of moulds for casting metals by means of ramming blocks constructed either entirely of metal, or with metallic surfaces firmly attached to a backing of Roman cement, or other suitable material, which metallic blocks or surfaces serve for moulding the partings of the sand or other material forming the mould, as well as for moulding the form of the article itself.

DANIEL, ALFRED, of Moorfields, Dudley-road, Wolverhampton, Stafford. *Improvements in locks and handles for the same.* Patent dated February 1, 1854. (No. 256.)

This invention is said to comprise the application of a new principle or action in the construction of one-bolted locks,—a mode of employing, wholly or in part, cast-iron cases to rim mortise and stock locks containing one, two, or more bolts,—a certain method of forming the patterns used for casting lock-cases, and the employment of a new principle or action in the construction of the nobs or handles for the same.

HARGREAVES, JAMES, cotton-spinner, and JAMES FLETCHER, manager, both of Facit, near Rochdale, Lancaster. *Certain improvements in machinery for preparing to be spun cotton and other fibrous materials.* Patent dated February 1, 1854. (No. 257.)

This invention relates to "scutchers," and consists in substituting either wholly or partly for the bars or blades of such machines, technically termed "beaters," card or toothed surfaces fixed on a cylinder or on the segments of a cylinder which will act upon the cotton or other fibrous material entering between the feed rollers; and it further relates to a method by which the draught of the air may be regulated.

BEATTIE, JOSEPH, of Lawn-place, South-street, Lambeth, Surrey, engineer. *Improvements in furnaces and in the treatment of steam.* Patent dated February 1, 1854. (No. 259.)

The principal features of this invention were described at length, vol. lx., page 481.

MOHLER, ADOLPHE, manufacturer, of Obernay (Bas Rhin), France. *Certain improvements in apparatus for lubricating machinery.* Patent dated February 2, 1854. (No. 261.)

The inventor constructs apparatus "in such manner that the lubricating liquid is raised and brought in contact with the rubbing surfaces by capillary attraction in conjunction with the motion of the moving parts."

WATSON, HENRY, of High-bridge, Newcastle-on-Tyne. *Improvements in the working of brass and copper into forms, and planishing them.* Patent dated Feb. 2, 1854. (No. 262.)

These improvements consist in giving motion to the hammers used for forming and planishing articles of copper and brass by mechanical means, for which purpose they are mounted in a suitable framing, and are moved up from the fixed anvils by means of a revolving axis and cams, and then fall by the action of gravity.

STEVENS, JAMES, of Darlington Works, Southwark-bridge-road. *Improvements in apparatus for giving railway signals.* Patent dated February 2, 1854. (No. 264.)

This invention consists of improvements in an invention for which letters patent have been granted to the inventor, consisting of a method of combining semaphore apparatus and lamps, so that the same act of the signal man may produce the desired signal by night or day.

GLASSFORD, JOHN HAMILTON, of Glasgow, Lanark, North Britain, lithographer. *Improvements in lithographic or zincographic printing.* Patent dated February 2, 1854. (No. 265.)

*Claims.*—1. A general arrangement of apparatus. 2. The employment of a self-acting damper or moistener, to which a curvilinear motion is given, by causing the points of suspension of the damper to rotate horizontally. 3. A mode of fixing the inking slab and stone or plate on the same carriage, or in such connection with each other that the traverse movement brings them alternately under a pair of reciprocating rollers, which take up the ink from the slab and apply it to the stone or plate. 4. The method of bevelling the front edge of the stone, so that it may enter easily under the scraper. 5. An arrangement for lifting the tympan off the stone, when it recedes from beneath the scraper. 6. An arrangement for taking up and measuring the material printed upon, &c.

SYKES, FREDERIC HENRY, of Cork-street, Piccadilly, esquire. *An improved apparatus for supplying or feeding boilers with water, applicable to raising and forcing liquids for other purposes.* Patent dated February 2, 1854. (No. 266.)

This apparatus consists of a pair of cylindrical vessels closed at the top and bottom, and a pipe leading from each of the vessels and connected with valves, of which there are two, each having two ports so arranged that two of four ports situated in the valve-seat are always open and two closed. To each of the valves are secured two pipes, which communicate with the ports and are carried into the boiler; one entering the lower part and the other the upper, so that one conveys steam into the cylindrical vessels, and the other water from them into the boiler. One of two other pipes connected with the valves conveys the water from the well or reservoir to the cylindrical vessels, while the other carries away the steam from the vessels to a condenser.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of Finsbury, London. *Certain improvements in the construction of buildings.* (A communication.) Patent dated February 3, 1854. (No. 267.)

This invention consists in the combination of bitumen and sand for the production of a bituminous cement applicable to the construction or coating of walls and basins for rendering them impervious to moisture, and in the application of this cement, in combination with other materials, to the production of blocks for the construction of canals, sewers, and cesspools.

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## COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

COX, JOHN, of Birmingham, Warwick, percussion-cap manufacturer. *Improvements in the manufacture of percussion-caps.* Application dated May 23, 1854. (No. 1153.)

This invention consists in completely lining the interior surface of percussion-caps with tin or other thin metallic foil, so as to thoroughly protect the detonating powder from the action of damp; and also in an improved method of finishing the cap, by pressing it into form after introducing the detonating powder between the cap and the lining.

BROUGH, NEHEMIAH, of Birmingham, Warwick, machinist. *Improvements in the manufacture of buttons, and in attaching them to articles of wearing apparel.* Application dated June 6, 1854. (No. 1257.)

The inventor constructs buttons of a shell, and a pronged shank by which the shell is attached to the garment.

SHIPLEY, SAMUEL SMITH, of Stoke Newington, Middlesex, gentleman. *Improvements in fittings suitable for dressing-cases, and for other purposes of elegance and utility.* Application dated June 27, 1854. (No. 1414.)

These improvements consist in the application to dressing-cases, &c., of opaque or other glass tubes or cases, in conjunction with certain caps or covers of metal, glass, or other material, and suitable fittings, for containing a brush, shaving soap, tooth-paste, pomade, &c.

STOCKER, ALEXANDER SOUTHWOOD, of Hall-street, City-road, Middlesex. *Certain improvements appertaining to match-boxes, and in the fitting, stoppering, and covering of tubes and other vessels of glass, porcelain, and other materials.* Application dated July 4, 1853. (No. 1458.)

The first and principal part of this invention consists in the application of cylindrical tubes of glass, porcelain, or such like materials to the manufacture of vesta or other match boxes, in combination with peculiarly manufactured metal tops and bottoms applied to such tubes.

AERTS, PAUL FRANÇOIS, of Brussels, Belgium, mechanical engineer. *Improvements in constructing parts of railway rolling stock, and in the lubrication thereof.* Application dated July 11, 1854. (No. 1513.)

The inventor constructs railway carriages, &c., of a moveable, an intermediate, and an upper frame. The first is arranged in three divisions or parts, which are allowed to play where the rails of the railway curve. The intermediate frame serves to join the moveable frame to the carriage or upper frame, upon which the buffer and traction apparatus and their appurtenances are fixed.

HENLEY, THOMAS FREDERICK, of Brompton, Middlesex, merchant. *Improvements in the preparation of certain colouring materials.*

Application dated July 11, 1854. (No. 1515.)

This invention consists in the preparation of colouring material from stick lac, or other varieties of lac, by means of a solution of ammonia; and in the preparation of a colouring material from the smaller branches, twigs, and leaves of the "tectona grandis, or teak, or saugun-tree."

EASSIE, WILLIAM, of Gloucester, railway-contractor. *Improvements in trucks used on railways.* Application dated July 12, 1854. (No. 1520.)

The inventor employs tubes or casings of India-rubber for preventing the shock occasioned by the sudden starting or stoppage of railway trucks.

CALLAN, NICHOLAS, of Maynooth College, Kildare, Ireland, professor. *A means by which iron of every kind may be protected against the action of the weather, and of various corroding substances, so that iron thus protected will answer for roofing, for cisterns, baths, gutters, window-frames, telegraphic wires, for marine and various other purposes, and by which brass and copper may be similarly protected.* Application dated July 21, 1854. (No. 1606.)

This invention consists—1. In coating iron, copper, and brass with an alloy of lead and tin, in which the quantity of lead is at least twice or three times as great in weight as that of tin. 2. In coating iron, copper, and brass with an alloy of lead, tin, zinc, and antimony. 3. In coating iron, copper, and brass with an alloy of tin and antimony. 4. In coating iron, copper, and brass with an alloy of tin, with any two of the three metals before mentioned.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in breech-loading fire-arms.* (A communication.) Application dated July 21, 1854. (No. 1607.)

This invention consists mainly in "making the breech in the form of a roller, whose axis is placed transversely to the axis of the barrel, and which fits up to the rear end of the chamber of the barrel, so as to close it effectually when loaded; but has an opening through it which is capable of being brought in line with the barrel, to serve as a passage through which to insert a charge either in the form of a cartridge or of loose powder and ball."

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

COX, THOMAS, of Wolverhampton, Stafford, clothier's assistant. *An improvement or improvements in buttons, and in attaching the same to articles of dress.* Application dated January 31, 1854. (No. 230.)

This invention consists mainly in the use of gutta percha for making the shanks of buttons.

ERCKMANN, CAROLINE, of La Villette, near Paris, France. *The manufacture of telegraphic wires.* Application dated January 31, 1854. (No. 235.)

This invention consists in substituting "glass, paper, cardboard, wood, or bone," for the gutta percha used in covering telegraph wires.

OLIVER, RICHARD, ROBERT BARLOW, and JAMES BLUNDELL, of Manchester, engravers and copartners. *Certain improvements in machinery or apparatus for embossing and cutting out patterns or devices for the ornamentation of textile fabrics or other materials or surfaces.* Application dated January 31, 1854. (No. 237.)

These improvements consist in cutting out patterns by means of a pair of revolving dies or cutting cylinders, so constructed that the one shall have the pattern or die projecting, and the other counter sunk, "so that by both dies fitting together as they revolve, and both having cutting edges, the piece or pattern between the revolving dies shall be cut out instead of being stamped, punched or otherwise pressed out, as heretofore."

BENDOT, PHILIBERT, of Boulevert Saint Martin, Paris, France. *Improvements in gas-burners.* Application dated January 31, 1854. (No. 244.)

This invention consists in a method of constructing burners in such manner that the gas is heated before it leaves them.

MORTRA, AUGUSTIN, machinist, of Paris, France. *Improvements in apparatus for stopping locomotive engines, wagons, or other vehicles on railways.* Application dated February 1, 1854. (No. 248.)

To the locomotive engine and each carriage the inventor attaches a cylinder, fitted with a piston and piston-rod, connected to the break; and conducts water or steam from the engine to such cylinder by a pipe, which extends from one end of the carriage to the other, and is connected by a branch to one end of the cylinder; the pipe of one carriage being connected to that of the next by a sliding jointed pipe.

BUCHANAN, JOHN, of Leamington Priors, Warwick, gentleman. *Improvements in propellers, and in applying them.* Application dated February 1, 1854. (No. 249.)

In this invention the propelling surfaces of a screw are placed in or on the shaft in advance of each other, "after the manner of a venetian blind, and not in radial lines as heretofore, and the breadth of each surface need not exceed the thickness of the main post of the vessel."

PAGE, CHARLES FRANÇOIS LE, literary

man, of Paris, France. *Certain improvements in apparatus for lighting.* Application dated February 1, 1854. (No. 254.)

In carrying out this invention a vertical cylindrical pipe is employed, containing tallow, or other solid fatty matter, which is pressed upwards by means of a piston worked by a rack and pinion.

MORRISON, JOHN DEWAR, of Sunderland, Durham, smith. *Improvements in winches.* Application dated February 1, 1854. (No. 258.)

The power is applied to Mr. Morrison's winches by one or more levers placed on a fixed centre near the drum or barrel. These levers communicate with the barrel by means of palls, or a ratchet-wheel on the end of it, so that a nearly continuous rotatory motion is obtained.

ATKINS, THOMAS, of Oxford, civil engineer. *Improvements in transmitting power and communicating motion to implements for agricultural and other purposes.* Application dated February 2, 1854. (No. 260.)

This invention consists in transmitting motion from the prime mover to the implements by means of an endless rope or cord running round a grooved wheel.

PARIS, CHARLES EMILE, chemist, of Paris, France. *Certain improvements in covering with metals certain metallic surfaces.* Application dated February 2, 1854. (No. 263.)

This invention consists in giving to articles of metal, which have already received a vitreous coating, a further coating of metal, by applying the metal in the form of powder or sheets to the vitreous surface, and then bringing the whole to a red heat.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *A new system of apparatus, to be called "Atmospheric Post," for transmitting letters and messages, and applicable to railways, and as a speaking-trumpet.* (A communication.) Application dated February 3, 1854. (No. 268.)

The inventor constructs apparatus so that when a valve is opened steam rushes through a blast-pipe into a vertical pipe, which communicates with the carrying channel, and at the same time the air contained in the latter is sucked out by the jet of steam, which carries it away into the atmosphere. The letters, &c., are to be placed in spherical boxes, which fit loosely in the channels.

## PROVISIONAL PROTECTIONS.

*Dated May* 22, 1854.

1133. Berkeley William Fase, of Charles street, Soho-square, Middlesex, jeweller. An improved construction of brooch for fastening dresses.

*Dated May* 26, 1854.

1177. James Lord, of Farnworth, Lancaster, manager. Improvements in the manufacture of articles of ladies' under clothing.

*Dated May* 29, 1854.

1189. William Northen, of Vauxhall-walk, Lambeth, Surrey, potter. Improvements in the manufacture of mangers and troughs for stables.

*Dated July* 11, 1854.

1519. Victor Gustave Abel Cuvier, chemist, of Seloncourt, France. An improved apparatus having for its object the combustion of fuel and the utilization of the gaseous products for heating, and other useful metallurgic purposes.

*Dated July* 13, 1854.

1543. John Baptist Chauvet, fils, of Aix, Provence. A new system of anchor.

*Dated July* 17, 1854.

1570. John Fowler the younger, of Temple Gate, Bristol, agricultural implement maker. Improvements in draining ploughs.

*Dated July* 20, 1854.

1593. George Jackson, of Manchester, Lancaster, decorator. Certain improvements in the construction of tents.

1595. Francis Whitehead and William Whitehead, both of Crayford, Kent, engineers. Improvements in safety lamps.

1597. William Palliser, of Comragh, Waterford, Esquire. Improvements in projectiles for firearms and ordnance generally.

*Dated July* 21, 1854.

1601. Amand Benoit Joseph Jean, manufacturer, and Alfred Alexandre Hugues, engineer, of Paris, France. Certain improvements in reducing the friction of axles, bearings, or other rotatory rubbing surfaces in machinery.

1603. John Thomas Moss, of Arundel-street, Strand, Middlesex, hotel manager. Improvements applicable to apparatus for roasting meat and other edible substances.

1605. Isaie Alexandre, of Bruxelles, but now at Birmingham, Warwick, merchant, and Alfred Sommerville, of Birmingham, merchant. An improvement or improvements in boots and shoes, and in socks or inner soles for boots and shoes.

1609. James Sedgwick, of Lewisham, Kent, master mariner. Improvements in ship-building.

1611. Charles Harratt, of Royal Exchange-buildings, London. Improvements in fastenings for ship-building.

*Dated July* 22, 1854.

1613. John Lamb, of Newcastle-under-Lyne, Stafford, paper manufacturer. Certain improvements in or applicable to machines for making paper. A communication.

1615. James Hadden Young, of College-street, Camden Town, Middlesex. Improvements in gathering grain and other crops, and securing the same.

1617. John Bainbridge, of Ely-place, Holborn-hill, Middlesex, agent. Improvements in fire-grates, stoves, furnaces, and other similar contrivances.

1619. James Dilks, of Parliament-street, Nottingham, lithographer and embosser. The application of printed or painted linen, cotton, or other textile fabric, either plain or ornamental, for binding more effectually than heretofore packets or parcels of lace, hosiery, or other articles.

*Dated July* 24, 1854.

1625. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in kneading-machines. A communication.

*Dated July* 26, 1854.

1638. James A. Cutting, of Boston, United States of America, photographer. An improved process of taking photographic pictures upon glass, and also of beautifying and preserving the same.

1640. Adolphus Oppenheimer, of Manchester, Lancaster, manufacturer. Certain improvements in the manufacture of mohair velvet or mohair plush and worsted velvet or worsted plush.

1642. Auguste Edouard Loradoux Bellford, of Castle-street, London. An improved mill for grinding paint and other moist substances. A communication from Charles Whitman Brown, of Boston, United States of America.

1644. Edmund Alfred Pontifex, of Shoe-lane, London, and Charles Glassford, of Ashburnham-grove, Greenwich. Improvements in obtaining soft lead from hard lead, for the separation of the impurities in hard lead, and for the separation of antimony from these impurities.

1646. Peter Augustin Godefroy, of King's Mead Cottages, New North-road, Islington. Improvements in purifying coal, naphtha, and turpentine.

1650. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in soldering metals. A communication.

*Dated July* 27, 1854.

1652. Richard Clarke Burleigh, of Northumberland-street, Charing-cross, Middlesex. Improvements in guns, and in the shot or other projectiles fired therefrom.

1654. François Desiré Molvé and Pierre Martin, of Paris, France, engineers. Certain improvements in heating water for feeding boilers of locomotives and marine steam engines.

1656. William Shorrocks, of Farnworth, Lancaster, spindle and fly-manufacturer. Improvements in presser-flyers, for preparing cotton and other fibrous substances for spinning.

1658. Barton H. Jenks, of Bridesburg, Pennsylvania, United States of America, manufacturer. Improving the art of weaving, being an improvement in looms for weaving fancy fabrics.

1660. Nathaniel Miller, of Guide Bridge, Lancaster, railway inspector, and Robert Graham, of the same place, overlooker. Certain improvements in the construction of certain parts of the permanent way of railways, commonly called crossings.

*Dated July* 28, 1854.

1662. George Lamb Scott, of Manchester, moulder, and Samuel Bennett, of Manchester, brass-founder and coppersmith. Improvements in springs for pressing together rollers for mangling and other purposes.

1666. Francis Morton, of Liverpool, Lancaster, engineer and contractor. Certain improvements applicable to girders or rafters to be used in the construction of roofs, bridges, buildings, and other erections.

1668. Samuel Clift, of Manchester, manufacturing chemist. Improvements in making paper, pasteboard, and papier-maché.

*Dated July* 29, 1854.

1670. Robert John Keen, of Liverpool, Lancaster, nautical and optical instrument-maker. Improvements in the mariner's compass.

1672. Edmund Burke, of Upper Thames-street, London, gentleman, and Alexander Southwood Stocker, of the Poultry, London, manufacturer. Certain improvements in the manufacture of metallic tubes and such like articles.

1674. William Henry Smith, of Bloomsbury, Middlesex, civil engineer. Certain improvements in the permanent way of railways.

1676. John Yuil Borland, of Manchester, Lancaster, machinist. Improvements in machinery for preparing and spinning fibrous materials.

1678. George Henry Ingall, of Warnford-court, Throgmorton-street, Middlesex, gentleman. Improvements in elastic bands for holding books and papers.

1682. George Thatcher, of Welton Midsomer Norton, Somerset. Improvements in the manufacture of woven fabrics, yarn, cordage, ropes, paper, and pasteboard, by the application of a material not hitherto used for such purposes.

*Dated July* 31, 1854.

1684. Henry Adams, of Leonidas-terrace, New-cross, Deptford, Surrey. A revolving ventilator.

1686. Joseph Green and William Jackson, both of Leeds, York, machinists. Improvements in mortising-machines.

1688. Thomas Ridgway Bridson, of Bolton-le-Moors, Lancaster, bleacher. Improvements in preparing cotton for manufacturing purposes.

*Dated August* 1, 1854.

1690. Jules Frédéric Bouneau, of Paris, France. Improvements in propelling ships.

1692. Christopher Ridout Read, of Moorgate-street, London. Improvements in slide-valves of steam engines. A communication.

1694. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the construction of repeating fire-arms. A communication.

1696. Thomas Edward Merritt, of Maidstone, Kent, drawing-master. Improvements in apparatus for taking photographic pictures in the open air.

*Dated August* 2, 1854.

1698. James Griffiths, of Wickham-market, Suffolk, gentleman. A new or improved lever bit for horses.

1700. George Holworthy Palmer, of Adelaide-road, Hampstead, Middlesex, civil engineer. Improvements in guns, gun-carriage, and appurtenances, and in the manipulation or working of guns. A communication.

1702. Joshua Brown, of Stockport, Chester, superintendent of police. Improvements in the method of consuming smoke.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 15*th*, 1854.)

757. Thomas Scott. Improvements in machinery for propelling.

758. James Forsyth. Improvements in machinery for preparing and spinning wool and other fibrous substances.

760. William Ashdown. Improvements in gas-stoves.

788. John Weston. Improvements in transmitting and applying motive power for propelling railway trains, ships, boats, barges, and such like vessels, and for other useful and mechanical purposes.

793. Simon O'Regan. Improvements in engine-boiler furnaces and other furnaces.

796. Emile Dupont. Improvements in the manufacture of certain cements.

801. James Worrall, junior. Certain improvements in the method of bleaching fustians and other textile fabrics, and in the machinery or apparatus connected therewith.

806. Henry Moss. An auriferous quartz washing, pulverizing, crushing, separating, and amalgamating machine.

807. Frederick Robert Augustus Glover. Improvements in two-wheeled carriages.

815. Henry Bollmann Condy. Improvements in concentrating beer, ale, cyder, wine, and vinegar.

824. John Corlett. Improved machinery for preparing or scutching flax, and other fibrous materials requiring such an operation. A communication.

847. Charles Anthony Noedl. A portable vapour bath.

850. Thomas Schofield Whitworth. Improvements in the mule for spinning and doubling cotton and other fibrous materials.

854. Benjamin Fothergill and William Weild. Improvements in machinery for combing cotton, wool, flax, silk, and other fibrous materials.

867. John Greenwood and Robert Smith. Certain improvements in sizeing, stiffening, and finishing textile materials or fabrics.

869. Charles Meason. Improvements in supplying fuel and water to locomotive engines, or to the tenders of locomotive engines.

965. James Heywood. Certain improvements in machinery or apparatus for printing yarns.

967. Benjamin Dixon. An improvement or improvements in the joints of measuring rules.

1002. John Manley. An improvement in ventilation, and in treating smoke so as to prevent the ascent of the denser particles thereof into the atmosphere.

1067. Auguste Edouard Loradoux Bellford. Certain improvements in carriage-axles and their boxes. A communication.

1120. Peter Armand Lecomte de Fontainemoreau. Improvements in connecting the permanent rails of railways. A communication.

1189. William Northen. Improvements in the manufacture of mangers and troughs for stables.

1195. Edouard Heinhold. Improvements in diurnal and nocturnal indicating apparatus.

1319. Peter Armand Lecomte de Fontainemoreau. Improvements in treating bitumen. A communication.

1359. Oliver Rice Chase. Improvements in machinery for manufacturing lozenges and for other purposes.

1389. Thomas Isaac Dimsdale. An improvement in the manufacture of gas for lighting and heating purposes.

1446. George Hutchison. An improvement or improvements in the manufacture of soap.

1510. Stephen Martin Saxby. An improvement or improvements in making fast, and letting go, the cords of window-blinds, which said improvement or improvements may also be applied to the fastening and letting go of ropes, cords, lines, wires, and chains, for various other purposes.

1536. Arthur James Lane. Improvements in breech-loading fire-arms.

1559. John Ashworth. Certain improvements in apparatus to be employed in the construction of the permanent way of railways.

1560. Thomas Summerfield. The manufacture of chromatic glass and glass-faced bricks, which said bricks are applicable to face work or fronts of buildings, basements, pilasters, string courses, door and window heads, modillions, cornices, in part or whole, or other purposes where a superior finish and durability are required; a part of which is also applicable to bricks made wholly of clay.

1583. Samuel Mitchell. Improvements in the manufacture of cards for carding wool, cotton, silk, and other fibrous materials.

1604. John Knight. An improvement or improvements in the manufacture of bricks, tiles, pipes, and other such articles as are or may be made of clay, which improvement or improvements may also be applied to the manufacture of artificial fuel and to other mixing and tempering processes.

1609. James Sedgwick. Improvements in ship-building.

1614. Thomas Firth and John Wilson. Improvements in finishing woollen, worsted, silk, and other woven fabrics, and in the apparatus employed therein.

1615. James Hadden Young. Improvements in gathering grain and other crops and securing the same.

1642. Auguste Edouard Loradoux Bellford. An improved mill for grinding paint and other moist substances. A communication.

1644. Edmund Alfred Pontifex and Charles Glassford. Improvements in obtaining soft lead from hard lead, for the separation of the impurities in hard lead, and for the separation of antimony from these impurities.

1650. Auguste Edouard Loradoux Bellford. Improvements in soldering metals. A communication.

1670. Robert John Keen. Improvements in the mariner's compass.

1688. Thomas Ridgway Bridson. Improvements in preparing cotton for manufacturing purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

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WEEKLY LIST OF PATENTS.

1854: *Sealed August* 12, 1854.

361. Patrick O'Conner.
371. Cromwell Fleetwood Varley.
373. John Greenwood and Robert Smith.

*Sealed August* 17, 1854.

378. Thomas Fawcett.
379. Thomas Macneill.
386. Robert Holt.
394. Bashley Britten.
396. Nicholas Riggenbach.
404. Thomas Towers.
412. Victor Pernollet.
432. Thomas Settle and Peter Cooper.
433. Adolphus Oppenheimer.
436. Charles Walker.
437. Thomas Danson Pruday.
459. Charles William Siemens.
521. William Edward Newton.
540. Pierre Amable de Sicard.
547. Thomas Dunn.
555. William Septimus Losh.
560. John Blair.
573. William Peace.
600. Benjamin Latchford.
606. George Hopper.
612. Johnson Hands.
618. Thomas Stephen Holt and Charles Herbert Holt.
622. Alfred Trueman.
623. William Weatherley and William Jordan.
632. James Cavanah.
633. John Lilley.
638. Thornton John Herapath.
684. Frederic Seiler.
688. James Newman.

695. John Jeyes.
846. James Childs.
931. James Warren.
976. James Hamilton.
982. Alfred Trueman.
1063. Charles William Aubusson.
1082. Richard Scott and Thomas Rowland.

## NOTICES TO CORRESPONDENTS.

*Constant Reader.*—We will endeavour to obtain the information for you.

*W. H. A.*—The form of electro-magnet you describe has already been employed by Mr. Allan, and probably by other experimentalists also. We thank you for the suggestion.

*R. H. S.*—We find the information you require cannot be condensed into the limits of a notice to correspondents; but, as the progress of the application of electro-magnetism is one of considerable importance, we shall endeavour to supply an article upon it in a short time. As yet we have seen no engine which is at all to be compared, in respect of either efficiency or economy, to that of Mr. Allan, described at page 265 of our last volume.

*J. C.* and *Engineer*, Manchester.—We will endeavour to insert yours in our next.



## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., *Dublin*; W. C. Campbell and Co., Hamburg.

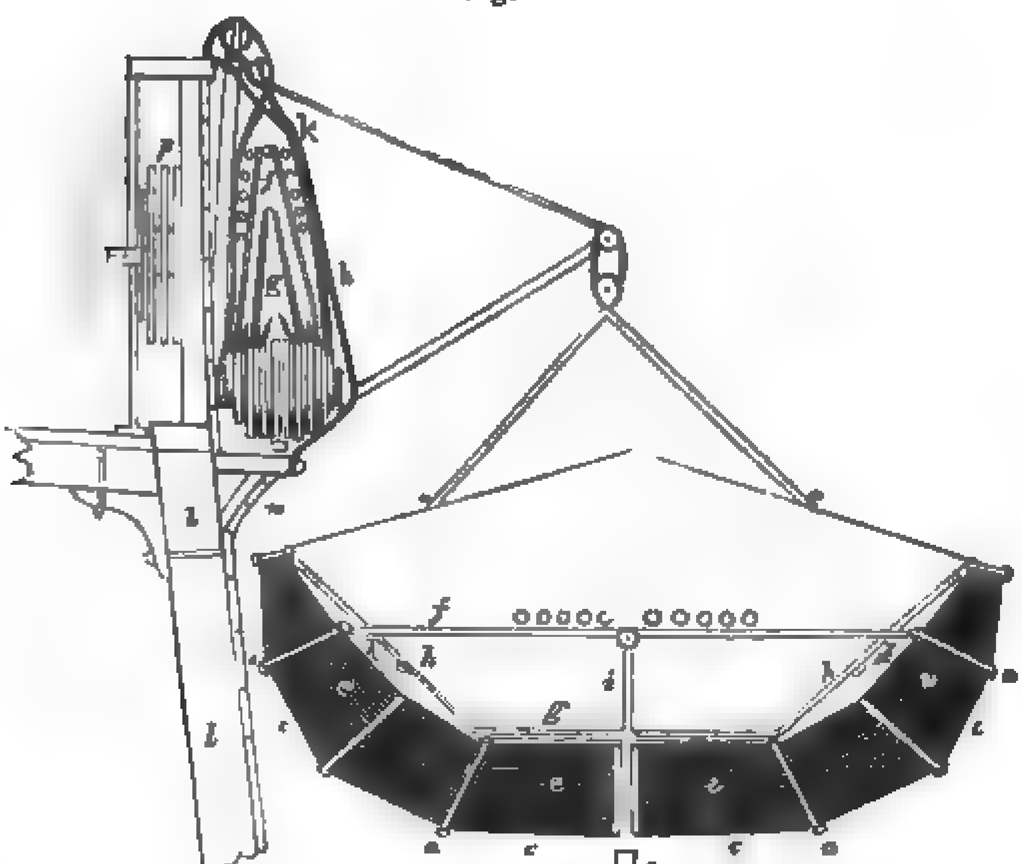
Mechanics' Magazine.

No. 1620.] SATURDAY, AUGUST 26, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## THE FAREHAM LIFE-BOAT.

Fig. 1.



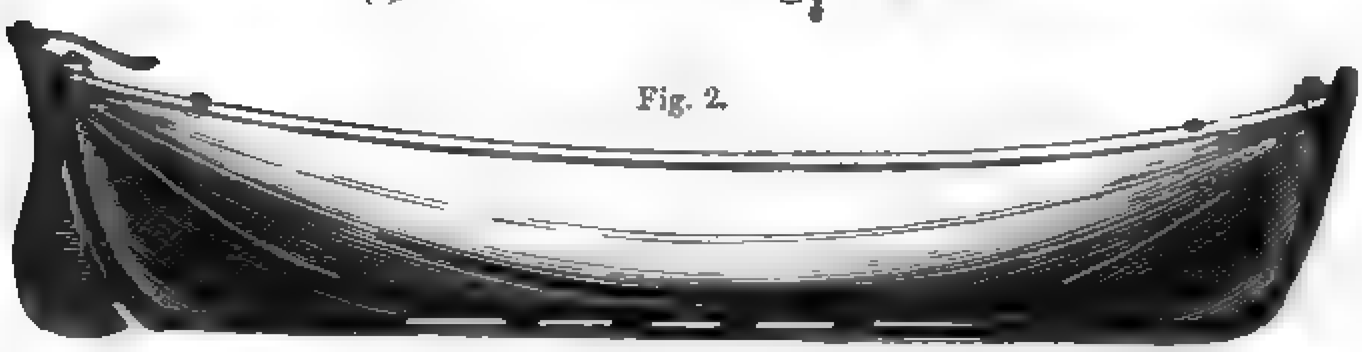
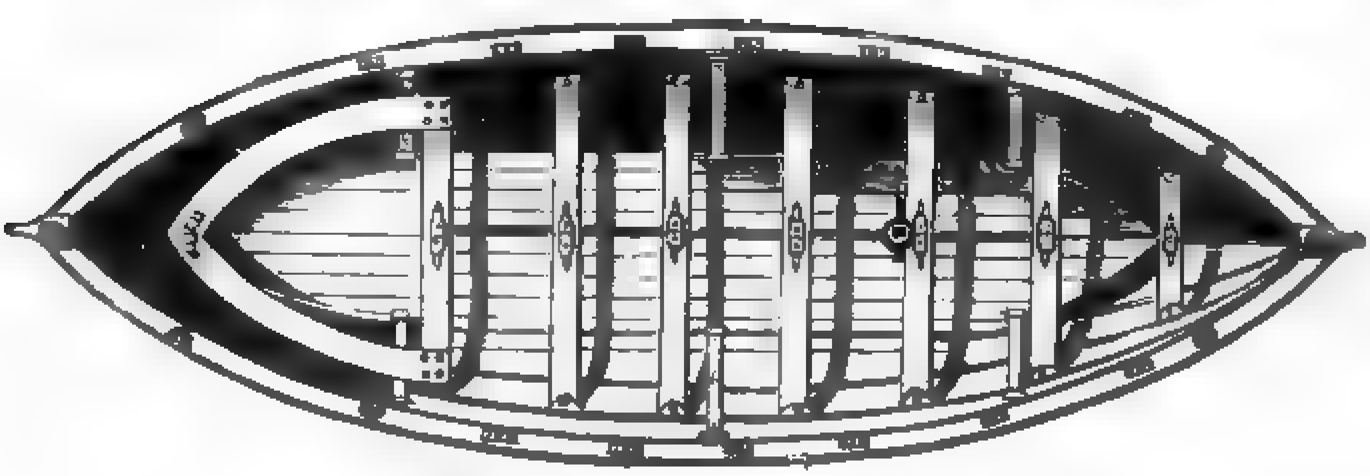


Fig. 2.

Fig. 3.



## THE FAREHAM LIFE-BOAT.

If any excuse be needed for bringing this life-boat (invented by the Rev. E. L. Berthon, of Fareham, and described in *Mech. Mag.*, vol. lv., No. 1460), a second time under the notice of our readers, it may be found in the fact that its excellent qualities have commended it to favour, and ensured its introduction into the Royal service, in which it will, before long, be found very valuable, probably for landing our troops on the shores of our enemy, as well as for other equally gratifying purposes.

The advantages which the inventor considers it to possess are—1. That it is stowed in one sixth of its width. When collapsed, it is frapped to against the ship's side, or in a recess in the bulwarks, from which it projects a few inches, being firmly secured there, and covered by a strong flap of doubled canvas. Thus being always outboard, the largest boat (say the size of a first-rate's barge or launch) is ready at a moment's notice. 2. Facility and quickness of lowering. One hand is enough to expand and lower the largest boat; he can expand it in three seconds, and lower it as rapidly or slowly as he pleases, and it is sure to take the water on an even keel. 3. Perfect insubmergibility. This it may be said to possess in common with other life-boats, but it has it in a greater degree; and this excellent quality is obtained in a new way, essentially belonging to this principle. It is made in eight longitudinal compartments, into which, when expanding by its own weight, a vast volume of air is inhaled: a boat 30 feet long inhales about 320 cubic feet in the act of expanding 4. The capability of discharging all water. It has a delivery channel nearly the whole length, fore and aft, so that if filled by a sea it empties itself almost immediately. 5. Security from being washed away or stove. Being stowed snugly against the bulwarks; not rising above nor projecting far from them, there is almost nothing for wind and sea to act upon. Immense boats may thus be stowed nearly out of sight, and yet be more easily and quickly lowered than a gig. Again, in case of fire, they are out of the way of harm, as the ship's top sides must be burnt before they can be injured. 6. Prevention of a rush to the boats in case of accident. These boats being collapsed, offer no resource for terrified passengers, whose crowding to the boats on the davits, and their consequent difficulty to lower, has been so often fatal: here, one man stationed at a break has the entire control over the boat, both to expand and lower. 7. No plugs. When shut up this boat holds no water, and wants no plugs, the absence of which after launching has been very fatal. 8. No caulking. These boats will never be leaky. 9. No davits. Falling derricks take their place, and are out of the way of everything.

In order to show that the foregoing estimate of the merits of this boat is not exaggerated, we subjoin a copy of a Report upon it, printed by order of the House of Commons, and furnished to the Admiral Superintendent of Portsmouth Dockyard by Mr. Abethell (the experienced master shipwright of that establishment), and two of his subordinate officers:

### REPORT ON BERTHON'S COLLAPSING LIFE-BOAT.

Portsmouth Dock-yard, 19th May, 1854.

Sir,—In obedience to directions contained in the Admiral Superintendent's memorandum of the 13th instant, we beg to state that we have examined the "Collapsing Life Boat" now in progress of construction, by the Rev. E. L. Berthon, of Fareham, and to report our "opinions on its mechanical construction, probable durability, and cost; and whether boats so constructed would be suitable for general service as troop boats."

And first,—*On its Mechanical Construction.*—The framework is composed of Canada elm timbers, extending in a fore and aft direction, the whole length of the boat, two inches thick, and varying from about eight to eighteen inches in depth. These timbers are eight in number, four on each side of the keel, and each timber is formed by cutting a thin Canada elm plank to the required shape, and strengthening it, by four battens of the same material brought upon each of its sides, both on its upper and lower edges: which battens are firmly fastened to the plank by bolts and marine glue.

The gunwale is also composed of six thin Canada elm planks, glued and bolted together, and the timbers are jointed together at their ends, and fastened into one compact mass at the stem and stern post by a chain hinge.

A block of wood is placed between the ends of these timbers on each side of the stem and stern post; and the two sides of the boat are firmly connected together, forward and aft, by an iron bar, extending from gunwale to gunwale.

These diagonal timbers stand side by side in vertical planes when the boat is collapsed, and in radical planes when expanded; and being properly shaped, this frame has been made to assume nearly the form of a common whale boat.

Over this frame are stretched two distinct skins, made of very strong durable waterproof

materi-ls, composed of prepared canvas, saturated with India rubber, which are secured to the edges of the timbers, the outer skin to the outer edges, and the inner skin to the inner edges. The whole body of the boat is by these means divided into eight tight longitudinal compartments, which are spontaneously filled with air at the moment when the boat is lowered, and expanded by its own weight falling on the gunwale spars, which action causes the timbers to separate and the air to rush in at the bow and stern, through apertures made for this purpose.

The extension of this boat is effected by the thwarts and bottom boards, which, being jointed in the middle, stand up at a very acute angle when the boat is collapsed, and fall down straight when it is open. These act as stretchers, and the more nearly they assume a straight line, the greater force they exert to maintain the boat in its permanent and proper shape. Two stretchers hinged in the middle are also fitted on each side of the boat, extending down the inside from the gunwale to the bottom boards, which act in a similar manner as the thwarts, and which thrust up the gunwale, and assist to maintain the whole frame in its required form and dimensions.

Its keel is twenty-two inches deep and forty-two inches thick amidships, and two bilge pieces are fitted on each side. The skins are covered over the edges of the timbers, are protected by slips of copper, and the whole of the iron work is galvanized.

This boat is of the following principal dimensions; viz.:—

| | |
|---|---|
| Length, over all . . . . . . | 30 feet. |
| Breadth, extreme . . . . . . | 10 „ |
| Depth . . . . . . . . . . | 4 feet 6 inches. |

It has six thwarts, with head and stern sheets, and can pull twelve oars, double banked.

From the small quantity of wood materials, &c., used in its construction, and the lightness of the outer and inner skins or coverings, its weight does not exceed twenty-three cwt., and the space which the boat occupies when collapsed, will not be more than two feet in width.

Independently of its form, its buoyancy is greatly increased by the air-tight compartments into which it is divided, which contain about 350 cubic feet of air, and which render the boat capable of carrying as many persons as could be stowed it.

Its efficiency as a life-boat is further provided for by the contrivance of the keel being made in two pieces, longitudinally, so as to form a groove or watercourse under the bottom boards in which such water as may be "shipped" runs, and is discharged through the bottom by means of a valve, opening outwards. It is not, however, capable of "righting" itself if upset by tempestuous weather.

And, secondly,—*On its Probable Durability.*—As the strain or tendency of the boat to "hog" or "sag" when suspended by the ends, or acted upon in a "seaway," is brought upon the diagonal timbers of the framework, edgewise, the strength of the fabric must be very great,—much greater than in boats of the ordinary construction with transverse timbers, built of wood materials in the usual manner.

Also, from the nature of the strong and flexible cloth with which the framework is covered, both inside and out, from its apparent property of resisting the vicissitudes of being "stove," as well as from the fact of its never requiring to be caulked, as never becoming leaky if carefully preserved, this boat is, in our opinion, equally if not more durable than one built of wood in the ordinary manner, and more efficient if suddenly required for use from such casualties as shipwreck, fire, &c.

And, thirdly,—*On the Cost of this Boat.*—We think its total cost will be from about £95 to £100; but from the peculiarity of its construction, and the nature of the materials employed, we are of opinion, that if boats of this description were to become generally used, a probable saving, both in workmanship and materials, might be effected upon the aggregate cost of about £15 or £20 per cent.

We would here beg to add that, should either the inside or outside skin of this boat receive injury, that the defect could be much more easily and expeditiously repaired than a similar defect in a boat composed wholly of wood materials; and we also consider that in the event of these boats being extensively required, that if the materials be properly shaped on shore and supplied, that such boats could be speedily put together by the artificers on board, and with the means which most vessels possess.

From a careful investigation of the subject, we are of opinion that the principle of its construction is not only original, but highly ingenious; and that if a boat be faithfully constructed upon the plan of the "Fareham life-boat," there is every probability that all the advantages proposed by the reverend inventor and patentee would in practice be fully realized.

In conclusion, Sir, we beg to add, that we have also examined a model of a boat con-

structed by the reverend gentleman in a similar manner, though of a different form to that of the "life boat," possessing great buoyancy, strength, and non-liability to injury from casualties which usually occur to boats on shipboard; and we have no hesitation in stating, as our opinion, that boats of this description would be admirably adapted for landing or embarking troops, conveying artillery, stores, &c., or for any other purpose for which boats of such burden would be required in Her Majesty's Navy or in the merchant service."

Fig. 1 of the accompanying engravings represents a section of the upper works of the ship, with the boat in two positions—stowed and lowering. *a a* are the timbers; *b* is the double keel; *c c*, the outer skin; *d d*, the inner skin; *e e*, the air-cells; *f*, the thwarts, with the oars lying upon them; *g*, the bottom boards; *h*, the gunwale supports; *i i*, the stanchions of the thwarts; *k k*, the span or slings hooked to the gunwale; *l l*, section of ship's side; *m*, a ledge projecting like a small channel from the side; *n*, a strong flap of canvas, which has a rod of galvanized iron on its loose edge; (this when hauled up to the top rail, or to the hammock-netting of a man-of-war, completes at once the cover and the frapping of the boat); *o*, the derricks; *p*, a section of a great sheave placed within the bulwark for lowering. Fig. 2 is a side elevation of the boat, and fig. 3 a plan, showing the arrangement of thwarts, bottom-boards, &c. The ring-bolts on the gunwales are those to which the spans are hooked. The oars and masts have been omitted in order to show the inside more clearly.

It remains only to describe the action of expanding and lowering. One man can do it all in a few seconds: he cuts the nettles that secure the flap, which falls and presents a ladder to the water; he releases the lever of the break, and begins to lower. The first effect is that the derricks fall, describing about one-sixth of a circle, the boat being still collapsed, having a small line round it, fastened to a shackle with a small pin; one pull upon a lanyard releases it, and the boat instantaneously flies open (or this lanyard, if made fast to the ship at a rather shorter distance than the boat will reach, is self-acting, and pulls itself out.)

All is now ready; the weight of the oars, masts, &c., have brought the thwarts to the straight line; the bottom-boards are now in their right position, the compartments are filled with air, and in less than half a minute from the moment of casting off the flap, the boat may be in the water, without the possibility of its descending otherwise than on an even keel. Indeed on one occasion on board H.M.S. *Sampson*, from the giving of the command, "Let go the frappings," till the boat was open and in the water, not more than five seconds elapsed, at the very longest.

The mode of hoisting these boats is either in the usual way, or by the lowering apparatus, to which a winch and ratch-wheel is adapted.

The collapsing of the boat is as easy as its expansion; by hooking two pendants from the derricks to ring-bolts on the tops of the stem and stern, and then slacking the falls, the boat shuts itself by its own weight, after the centres of the thwarts are raised.

## THE VENTILATION OF METALLIC MINES.

BY HERBERT MACKWORTH, ESQ., M. INST. C. E., ETC., GOVERNMENT INSPECTOR OF MINES.*

SINCE the discovery, in 1757, of carbonic acid gas, and of oxygen, in 1774, a light has penetrated the avenues of chemical science, by which many phenomena affecting the composition and condition of the atmosphere have been discovered, and made subservient to the wants and purposes of man.

The more patent sources of disease have been carefully investigated, and the consequence of their partial removal has already been to increase materially the average duration of life. The reports of the sanatory commissions, and the public journals, testify to the number of talented labourers in the field of vital statistics, and to the universal interest which is felt in the subject of the ventilation of towns and dwellings; but, if we except the valuable Reports of the Children's Employment Commissioners, little attention has been paid to the sanatory condition of the mines of this country, which employ, underground, a population of nearly one-third of a million.

No one who has carefully examined the various kinds of mines, so as to compare the effect of the air existing in ordinary metallic or coal mines with the improved ventilation in some of the latter, can fail to observe the injury to health, the shortening of life, and the diminution of labour, which is produced in most of the mines of this country, whether copper, tin, coal, or iron, by the want of an adequate circulation of air.

The Royal Institution of Cornwall, many years ago, called attention to this important subject, and by means of the valuable statistics and remarks contributed by Dr.

* Read before the Royal Cornwall Polytechnic Society.

Barham, and other members, to the pages of its Transactions, has established the fact of the excessive mortality of miners, and that peculiar diseases are engendered by the noxious atmosphere ordinarily existing in the Cornish mines.

In the twenty-second Annual Report, page 68, Dr. Barham states: "The more recent examination of the registers of Gwennap and Stythians by Mr. Blee (comprising the two first years of the new registration, and including only those who have died above thirty years of age) gives the average longevity of miners as forty-six, and sixty years for other males. It may be suspected that among the latter were not a few who had formerly been miners, but who were classed under their later employment; besides that in this division a portion of persons in comparatively easy circumstances would be found who are more likely to attain advanced age than any class of labourers. The above remark as to change of occupation applies equally to the valuable comparative table of miners and other labourers furnished by Mr. Lanyon. The average age of 2,145 working miners was thirty years four months, that of 1,033 labourers forty years four months. Mr. Lanyon has himself directed attention to the numerous instances of the withdrawal of miners, when they find their health or activity fail, to other pursuits for which the same vigour is not absolutely requisite. On the whole, it may perhaps be a fairer deduction from the data hitherto collected as to the comparative longevity of miners, and other labourers in nearly similar general circumstances in this country, that ten, rather than twenty years approximates to the period by which the average life of the miner is shortened by his occupation."

* * * *

With regard to ironstone mines the Report says, page 196:

"The shallowness of the ironstone mines renders it more difficult to ventilate them properly, and consequently they are not only generally more wet, but are also less abundantly supplied with pure air than the coal mines; hence pulmonary diseases are still more frequent and severe even than in the coal mines, and rheumatism, inflammation of the joints, and scrofulous diseases of the glands far more common."

This evidence, confirmed by my own observation in these and other districts, forms but a fraction of that which might be quoted. It is sufficient to indicate that on the proprietors and managers of mines devolves the duty to humanity, to their workmen, and to themselves, of inquiring whether it is necessary for the prosecution of mines to shorten a miner's life by more than ten years out of thirty, or whether, on the contrary, employers would not greatly benefit by the increased labour, which might be rendered practicable by the supply to their men of a larger quantity of that vital sustenance, which is more necessary than food itself. Apart from the misery which afflicts his declining years, and the burden thrown upon the parishes by the pauperism of his family, the increase of commerce and the scarcity of skilled labour renders the life of the miner every day more entitled to national solicitude. Explosions of fire-damp in coal mines, every thirty years, hurry into eternity about one in twenty-seven of those employed, and excite a general feeling of horror and reprobation; but causes which are equivalent in their operation to a destruction of one life out of three, whether rapid or not in their effects, ought surely to exact our utmost and unremitting efforts for their removal. It may shock our philanthropic feelings, but it is no less stern a truth that the causes of mortality due to the improper ventilation of mines can be, under all circumstances, nearly, if not entirely, removed.

In compliance with the invitation of several members of this institution, I am happy to embrace this opportunity of explaining the remedies which elsewhere (in the supervision of a district containing upwards of four hundred mines) I have constantly occasion to propose, and to see successfully applied. My attention having been long directed to the ventilation of metallic as well as coal mines in this and other countries, I purpose confining myself, as far as possible, to the practical details and explanations which this question demands; trusting that I shall not underrate the efforts to improve ventilation which have been made in this county.

To use the words of Mr. John Taylor (in a valuable paper on this subject, written as long ago as 1810, and to which the Society of Arts accorded a medal):—

"Next in importance to the means employed for draining underground work from water, may be reckoned those which are intended to afford a supply of pure air, sufficient to enable the workmen to continue their operations with ease and safety to themselves, and to keep up undiminished the artificial light on which they depend. We find that a single shaft not communicating by levels with another can hardly be sunk to any considerable depth; nor can a level (or as the foreign miners call it a gallery) be driven horizontally to any great distance without some contrivance being had recourse to for procuring currents of air to make up the deficiency of oxygen, which is so rapidly consumed by respiration

and combustion in situations like these where otherwise the whole remains in nearly a stagnant condition."

Happily, man in his natural state has the temperature and pressure rather than the chemical changes of atmosphere to encounter. The supply of air to the lungs produces a chemical action similar to that of a candle or a furnace in ignition. It sets in motion the human machine, and the twenty breaths we draw every minute depend on the wonderful exactness of composition of air which is found in the highest altitudes reached by the aeronaut, in the heart of cities, at the equator, or near the poles. The varying temperature and moisture of day and night, the rotation and inequalities of the earth, the tidal motion of the atmosphere, in short, a multitude of causes harmonise in the simple maintenance of 79 per cent. of nitrogen, and 21 per cent. of oxygen, which nature points out as alone suited to the delicate organizations of animal life.

Atmospheric temperature is permitted, by the wisdom of Providence, to affect our frames. Mind and body yield to the influence of climate. Although man can sustain, without injury, a temperature of 60° below zero, and 300° above, when the air is motionless, yet the earth classifies its animal and vegetable life, as well as the physical and mental distinctions of its inhabitants, within the first 100° of Fahrenheit's thermometer.

Moreover, while the ordinary variations in the pressure of air do not exceed one-fifteenth, yet the extremes of physical endurance are not reached until the pressure and density are diminished one-half (at an elevation of 15,000 feet, where the least exertion becomes painful), or until increased to three or four atmospheres; as condensed by air-pumps, it is employed by Monsieur Triger in sinking pits through quicksand, in the coal basin of the Loire; occasioning severe pains and cramps in the joints of the men after they have worked in these pits for several hours.

A candle will begin to burn dimly, according to Dr. Wehrle, when the proportion of oxygen in the air is diminished from 21 per cent. to 18, and be extinguished when this proportion falls to 16; whilst suffocation will gradually ensue at the point of 14 per cent. But it is no less true that permanent injury is caused to the health of men living and working in an atmosphere deficient in oxygen to a much less degree than that which visibly affects the flame of a candle.

The condition of the miner could be realised if a room, containing a number of persons, were hermetically sealed until the temperature was raised by many degrees, and the lights burnt dimly. It is evident that under such circumstances there must be a falling off in the work done; and it has often been admitted by colliers, that an improvement in the ventilation has enabled them to execute from one-third to one-fourth more work in the same time, although from long habituation to the warm atmosphere and the poor air they objected to the change.

In the collieries which contain fire-damp, there is usually a sufficient circulation of air for the health and vigour of the colliers, though not to dilute the carburetted hydrogen to a safe degree. I have made a comparison between the average work done by a man in these collieries and in those where there is no fire-damp, and the ventilation is deficient, and I find that the work done is one-fifth more in the former collieries, including the whole cost of ventilation.

The same circumstances exist in Belgium, and Dr. Hanot was there able, from long practice, at once to distinguish a man working in ordinary collieries by the livid appearance of his face, arising from want of oxygen. By the improvement of ventilation in that country, a peculiar disease called anémie, to which the miners were subject, has almost entirely disappeared.

Whilst I was the engineer of the Huddersfield and Manchester Railway I witnessed and myself experienced a remarkable example of the effects of ventilation in the Standedge tunnel. Soon after the commencement of the tunnel a large proportion of the miners and agents, whose duties led them to remain long under-ground, were laid up by inflammatory affections of the chest and windpipe, accompanied by complete loss of voice. The coal-smoke from boats in the tunnel seemed to be the principal cause, as the expectoration was loaded with carbonaceous matter, and when I had the smoke stopped, the cases of disease diminished, and, by an improved ventilation, disappeared.

The analysis of eighteen samples of air, taken in four mines in this county, at an average depth of 214 fathoms, and an average distance of 28 fathoms from any shaft or winze, and furnished to this Institution by Mr. M. P. Moyle, gave a mean per centage of 17·067 oxygen, 82·848 nitrogen, and 0·085 carbonic acid gas. This air has been deprived of its oxygen either by the breathing of the men, the combustion of the lights, or the decomposition of mineral substances, of timber, or of animal substances in the mine.

The quantity of air breathed by a man per minute is about half a cubic foot. The lungs absorb 8 per cent. of oxygen, while an equal quantity of carbonic acid gas, as well as steam, is exhaled into the atmo-

sphere. A candle burns per minute about one-seventh of a cubic foot of air.

Humidity and temperature favour the change of some sulphurets into sulphates, protoxides, and peroxides, by the absorption of oxygen. Animal and vegetable substances in a state of putrid fermentation (of both of which there are large accumulations in every mine) give off carbonic acid gas, and compounds of carbon and nitrogen, nitrogen and ammonia, as well as various miasmata, thereby producing a noxious atmosphere; and to these gases must be added, as frequently present in mines, sulphuretted hydrogen, arsenical vapours, and powder-smoke; the visible part of which consists of the solid particles of the compounds of potassium floating in the air. The combination of some or all of these poisonous exhalations renders a much larger circulation of air requisite in mines than in dwellings on the surface. Even with regard to the latter, and referring to the superiority of cold and dry air (the opposite in both respects of the air found in mines), Dr. Reid remarks:—"The result of actual experiments in this country has satisfied me that a supply of 100 cubic feet of air, on some occasions, does not give so much relief as that of a few cubic feet in others." Again, Monsieur Gonot, one of the first authorities on mine ventilation, concludes, from experiments he has made, that the rate of diffusion of gases to which we ordinarily attribute the purity of air, is not verified in the conditions of air in mines. The extinction of a candle when held in a rising winze, and other examples, might be brought in support of the opinion.

The result of a great number of observations which I have made in coal mines is, that if an amount of air equivalent to 100 cubic feet per minute for each man or boy is not carried through the main passages of the mine, there is a falling off in the amount of work performed.

A slight difference may be allowed in consequence of the formation of carbonic acid gas from the slow spontaneous decomposition of some coals; but in all metallic mines where no gases issue from the natural crevices, this quantity of air should be taken as the standard to be obtained. In coal mines, where fire-damp exudes, the quantity of air actually passing through the workings varies from 200 to 600 cubic feet per man per minute; and if properly distributed, and carried along the working faces, is amply sufficient to dilute the gas escaping from the coal or rock. Three-fourths of the explosions of fire-damp are owing to the air being made to descend in parts of the mine where the carburetted hydrogen gas is escaping, and which, from being only half the weight of air, is not readily forced down by the descending current, but forms an accumulation in the higher parts of the works, sufficient sometimes to stop the current altogether.

In removing the carbonic acid gas, which in Cornish mines is often sufficient to prove fatal to life, the same attention to the specific gravity of the gas is required.

Before entering workings which have not been visited for some days, it is prudent always first to lower a candle, and on no account to enter them until, by throwing down water, or a solution of quick-lime, or letting fall a bundle of straw fastened to a rope, the gas has been sufficiently mixed with air to allow a candle to burn.

One of the commonest drawbacks in mining is the loss of time from the denseness of the smoke which hangs near the working-face after a shot has been fired. Frequently in summer, when ventilation stagnates or reverses, candles will not burn unless held sideways. Mines, or parts of mines, have to be abandoned for days or weeks, and men will sometimes work in the dark.

The great depth of the Cornish mines, in lieu of becoming, as it ought, a source of increased ventilation, at present occasions a poorness in the air, or a temperature approaching 100°, so that the miners sometimes have to plunge into water several times during their short relays of painfully laborious work. The cost of working is very much enhanced, and parts of lodes, otherwise workable, are abandoned. Added to this is the rapid decay of timber, which, if preserved by an improved ventilation, would alone pay the expense of any outlay requisite to effect this object.

The question has now arisen as to the depth to which workings can be profitably extended, and in the present demand for mining produce, by what means the levels or winzes can be carried forward most rapidly.

In reply, I append an experiment, by Mr. Nicholas Wood, on the natural ventilation of the Seaton Colliery, where the air, from a temperature of 44° at the surface, gained 5½° in descending 260 fathoms, being just the increase due to the latent heat becoming sensible by the compression of the air at that depth.

### EXPERIMENTS MADE AT SEATON PIT ON NATURAL VENTILATION.

Depth of pit, 260 fathoms, or 1,560 feet: diameter of pit, 14 feet, divided equally by a timber brattice, air tight, from top to bottom.

| Depth from top of Pit. | Temperature. | | Difference of Temperature. |
|---|---|---|---|
| | Downcast. | Upcast. | |
| Feet. | Degs. Far. | Degs. Far. | Degs. Far. |
| At Bank. | 44 | 46 | 2 |
| ,, 120 | 44 | 47·5 | 3·5 |
| ,, 240 | 43·75 | 48 | 4·25 |
| ,, 360 | 44·25 | 48 | 3·75 |
| ,, 480 | 44·25 | 48 | 3·75 |
| ,, 600 | 44·75 | 48·25 | 3·5 |
| ,, 720 | 45·25 | 49 | 3·75 |
| ,, 840 | 45·25 | 49 | 3 75 |
| ,, 960 | 45·5 | 49 | 3·5 |
| ,, 1,080 | 46·5 | 49·25 | 2·75 |
| ,, 1,200 | 47 75 | 51 | 3·25 |
| ,, 1,320 | 48·5 | 51·75 | 3·25 |
| ,, 1,440 | 49· | 52 | 3· |
| ,, 1,560 | 49·5 | 52·5 | 3· |
| Average. | 46 | 49·5 | 3 5 |

Quantity of air, 7,002 cubic feet per minute: length of air courses, 3,036 feet, the air being split on each side of the shaft: average area of air-courses, 24 square feet, with some small contractions. In travelling a distance of 1,000 yards underground, which the air performed in twenty minutes, the temperature rose from 49½° to 52½°, that is 3°. The superficies of the air-ways amounted to 60,720 square feet, and this raised the temperature of 7,002 cubic feet of air per minute by 3°. It is therefore evident that the depth or extent of a Cornish mine presents no great difficulty whatever in supplying the workmen with cold and pure air in any part of it.

The temperature of the extremities of a Cornish mine usually varies from 75° to 90°, and in isolated cases it reaches 105°, whereas the average temperature in a well-ventilated coal mine rarely exceeds 68° in summer or winter at a depth of 150 fathoms, and varies in those mines which I have visited from 62° to 68° when the men were at work, the hygrometer usually indicating very nearly the point of saturation with aqueous vapour.

Fifty miners with their lights will give off sufficient heat to raise 50,000 cubic feet of air, at a temperature of 55°, by one degree every minute. If seventy men had therefore been at work in the Seaton Colliery during the experiment described, the air would have been raised to 63°; the ordinary temperature of return air.

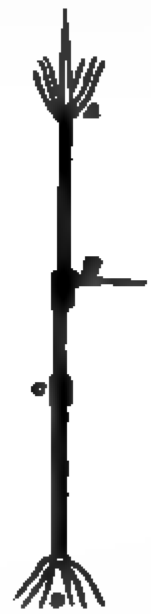
Deficient ventilation usually arises from inattention to the physical properties of air, by which a current can be produced, and instead of economizing that power which the temperature, density, or condition of air place at our disposal, these forces are allowed more or less to counteract one another.

*(To be continued.)*

## GATCHELL'S LIGHTNING ROD.

Our last number contained a short account of this rod, a model of which was referred by Mr. Brown to the Franklin Institute Committee on Science and the Arts, for examination. The Report of the Committee was as follows:

That in the proposition presented by Mr. Brown, no claim is made for any "new invention," but for "a new combination and arrangement of what has heretofore been used." In effecting this new combination, which is intended to include in it all that has heretofore been by experience found useful, the requisite attention has been paid in succession to the point, the body of the rod, and its termination in the ground.



In regard to the point, it is constructed by "sharpening the iron rod so as to receive the usual gilt platina point; sliding down on this point, is a ball or button of zinc, into which are cast six or more pointed copper wires, each diverging from the main point." This arrangement is credited to Dr. Hare, to whom it belongs.

There can be no doubt of the increased efficiency of a rod thus constructed, although we think that the reason given by Mr. Brown for this increase, is not the true one. There is, so far as the committee know, no experiment to show a single point, when in good condition and properly connected with the earth, is not quite sufficient to discharge the heaviest thunder cloud quietly and more rapidly than the cloud can approach it. In all cases where a pointed lightning rod has been struck, and where an examination has been made, the connection with the earth has been found defective.* But if it be

* This opinion applies especially to conductors on land; for Mr. Harris has given cases of ships being struck at sea, where the lower connection

remembered, that Professor Henry has shown that a lightning rod is so far under the influence of a thunder cloud, even at a distance of twenty miles, as to indicate a current through the rod sufficient to magnetize needles, whenever a flash takes place from the cloud; and if we further notice that when the cloud is at a distance from the rod, the upright point is not presented towards it, and is therefore comparatively, if not totally, inefficient, it will be seen that the brush of points diverging from the rod will be useful, because one at least of them will point towards the cloud, while approaching, at such a time before its reaching the striking distance, as to allow the whole of its electricity to be discharged silently and unnoticed. For it must be insisted on, that the true function of the lightning rod is not to receive a spark from the cloud, and to convey it harmlessly to the ground—whenever this happens, there is insufficiency in the system—but it is to begin its influence by induction, upon the cloud when at a distance, and by the continuance of this influence, to discharge the electricity in a silent and unnoticed current, so that when the cloud, pushed before the wind, passes near the protected mansion, its dangerous contents have entirely disappeared, and it floats harmlessly on its journey. This view follows necessarily from the experiments of Franklin on the influence of the point, and from the beautiful explanation which Faraday has given of this influence. It serves also to explain why the efficiency of the rod depends upon the area of the cross-section, and not upon its surface. The Committee are aware that Mr. Harris has explained this differently in his excellent treatise upon the Lightning-rod; but we regard his explanation as erroneous, since Henry has clearly shown by experiment that electricity of tension passes entirely by the surface, and not through the mass of the conductor, and that when passing over a plate, its self-repulsion is such as to cause the greater part to pass by the edges, rather than distribute itself uniformly over the area. The inductive effect, however, which is produced in a rod by a cloud at a distance, will be necessarily of such low tension as to resemble the galvanic current, which, as is well known, passes through the body of its conductor, and not over the surface alone. While, therefore, we agree as to the practical value to be attributed to the brush termination of the lightning rod, we suggest the necessity of bending the points outwards, so as to make a large angle (say 45°) with the vertical, as has been done in this rod, although it is not noticed in his communication.

The action of the zinc ball, to prevent or retard the oxidation of the copper rods, is unquestionable.

To form the body of the conductor, "iron rods are put together with screw sockets (same as gas pipes)." There can be no doubt of the propriety of this plan, or that of soldering, for too much stress cannot be placed upon the necessity of maintaining a perfect metallic contact between all parts of the conductor. The method so commonly used, of linking the joints of a rod together, is altogether inefficient, and could only have been adopted under the erroneous notion before alluded to, that the rod is to receive a spark from the cloud. Were this the case, no doubt an interval of even a quarter of an inch, of an imperfect conductor, such as iron-rust, would make but little difference, (except under peculiar circumstances, such as the vicinity of large masses of metal, &c.); for the discharge which has tension enough to pass over a hundred or more feet of air, will not be turned from its course by a half-inch of iron rust. But such is, in reality, by no means the case, as we have endeavoured to show. The effect of the rod begins while the cloud is at a distance, and if it be in good order, the cloud should be discharged before it comes into its vicinity. The current thus generated is, however, very feeble, and if it be interrupted by the slightest breaks, the good effect of the point ceases, until tension be accumulated sufficient to force the passage; the electric effect shows itself in sparks, the cloud is but slowly discharged, and there may, perhaps, be a danger of the rod receiving an amount of electricity which it cannot instantly and harmlessly convey to the ground. The joints of the rod should be therefore screwed or soldered together, or both, and, as an excess of precaution, where the expense is not an objection, we would recommend that the rod should be of copper, which is a much better conductor than iron; though there appears no record of any thunder-bolt so heavy as not to be safely passed by a bar of iron of one square inch, or even less, of cross section.

Where, however, the rod is of iron, as it will be in the great majority of cases, we have no hesitation in indorsing the opinion of Mr. Brown, that "The addition of the zinc ball and copper wires to the lower end of the rod will greatly facilitate the dis-

was probably perfect. But, laying aside the question of defective conduction in chains, to which our remarks on the inductive effects of the lightning rod are peculiarly applicable, these instances would seem to strengthen the explanation we have given of the brush; for a ship at sea will be heeled over to leeward, and have the point of the rod directed away from the cloud, thus losing the first effect upon which we have particularly insisted.

charge of electricity into the earth." In fact, the committee believe that the greater part of the accidents which have happened to buildings armed with what were supposed to be properly constructed lightning-rods, have arisen from the rusting off of the iron just below the ground. Generally speaking, the accidents alluded to are trifling, and are principally injurious by shaking confidence in the efficacy of the protection offered; but it is believed that the annoyance from them can most frequently be avoided by securing the free metallic communication between the bottom of the rod and the moist earth. In a city, this is best done by connecting it with the gas or water pipes; in the country, the rod should be carried down to such a depth as to insure a constant supply of water. Particular attention to this point should be paid in the case of houses standing upon a hill, where during our continuous dry summer weather the earth is apt to become baked to a very great depth. In such cases, the electric discharge has been seen to pass from the foot of a lightning-rod over the surface of the ground (probably conducted by the moisture of the grass) to the springs at the foot of the hill.

Both the zinc balls should be soldered to the rod.

The Committee also agree in the opinion expressed by Mr Brown, who "Does not consider the insulation of a rod important, and has adopted insulators only on account of the time-honoured custom of using them."

The law of an electrical discharge is, that it will divide itself between the conductors offering themselves, so that each conductor will take a quantity inversely proportioned to its resistance. Now, if the lightning-rod be in perfect metallic contact throughout, and well-connected with the ground, the resistance which it offers is almost infinitely less than can be found through any materials of which a building is usually constructed. Cavendish found that water, which is the best conductor after the metals, conducted electricity with 200,000 times less facility; and even though we assume that this number is far too large, yet margin enough is left to justify the assertion that, with a well-constructed rod, the divergence of the discharge through any except a metallic conductor is practically unimportant. But this conclusion assumes the rod to be perfect in all its conditions; for if, whether owing to deficiency in this point, or in its conducting capacity, it be struck, it is well known, by the experiments of Faraday and others, that portions of the passing discharge may be drawn off as sparks, and that these sparks will sometimes *pass through a considerable* distance of a non-conductor. (See "Sturgeon's Kite Experiments.") Such phenomena (known as the lateral discharge) are annoying, and may in some cases become dangerous; but it is doubted whether insulation is the true mode of avoiding them.

Similar phenomena, perhaps, still more frequently occur from the inductive effect exerted by the discharge during its passage, upon any masses of conducting bodies insulated from the rod. Such bodies become charged during the passage of the current, and upon its ceasing may give off sparks as they themselves return to the neutral state, which sparks may be a source of annoyance, or even danger. The true method of avoiding these effects is to connect every mass of conducting matter at both ends with the rod itself, when every indication of the kind, whether it be due to the branch discharge or to the inductive effect of the primary current, will cease.

Where two rods are erected, they should be connected together along the ridge-pole of the roof.

The Committee, therefore, in conclusion express their opinion, that in the lightning-rod submitted by Mr. A. C. Brown, proper attention has been paid to securing the best conditions which a lightning-rod should possess; and they believe that the rod, as proposed to be constructed, may and ought to be recommended by the Franklin Institute, as being in a very high degree cheap, durable, and efficient.

## RAILWAY COLLISIONS.

The following circular has been issued by the Railway Department of the Board of Trade.

"Whitehall, August 12.

"Sir,—The Lords of the Committee of Privy Council for Trade are desirous of calling the attention of railway companies to a system of working the trains, which is in use on some railways to a limited extent, and which promises to afford security from accidents occasioned by collision between trains following each other upon the same line of rails.

"This class of accident has been hitherto very numerous, as compared with other classes. In 1853 the total number of accidents to trains reported to this department was 103, of which 30 occurred to trains following each other upon the same line of rails; and, in the six months ended the 30th of June in the present year, the total number of accidents to trains which came under the cognizance of this department amounted to 47, of which 13 occurred by collision be-

tween trains following each other upon the same line of rails.

"The system under which trains are ordinarily worked is, that trains should not be allowed to approach each other within a certain interval of space; and, to effect this object, signals are exhibited during a certain time after the passage of a train, and no succeeding train is allowed to follow until such interval has elapsed.

"Experience, however, shows that this mode of endeavouring to secure a certain interval of space between succeeding trains will occasionally fail in cases where the speed of the respective trains varies, or where accidents occur to the machinery of trains; and when from any cause a train becomes stationary on a part of the line away from stations, its safety from collision with a succeeding train is dependent upon the chance of such succeeding train being at such a distance as to allow time for the guard to run back with a signal.

"With the view of effectually securing that an interval of space shall, under all circumstances, be at all times maintained between trains following each other upon a line of railway, the South-Eastern Railway Company have, on portions of their railway, placed electric telegraphic stations at intervals along the line; and no train is allowed to pass one of these stations, and to move upon the line between it and the next station, until a notification has been received from the next station that the preceding train has passed off that portion of line.

"On portions of the line where the trains are numerous, and the intervals between them are necessarily very short, these stations have been placed at little more than a mile apart; but upon parts of the line where the number of trains is more limited, the distance between the ordinary passenger stations has not been found too great an interval.

"Into the detailed arrangements my Lords purposely abstain from entering; they would, however, add, that in order that the system should be effectual, it is necessary that a telegraphic wire be exclusively reserved for this service; and that the instruments used should be simple, and should exhibit the signals with sufficient clearness for the signalling to be carried on by a person of ordinary intelligence.

"My Lords are aware that, from considerations of expense or otherwise, this system has not been generally adopted; yet, in parts where a single line only has been laid, or where peculiar difficulties exist in the working, or in tunnels, directors of railway companies have resorted to it with the most beneficial results.

"My Lords are, therefore, desirous that the subject should receive the careful consideration of the directors of the different companies, in the hope that the consideration may lead to the more general adoption of a plan which experience seems to have proved to be so well calculated to diminish the risk of danger.

"I have the honour to be, Sir,
"Your most obedient servant,
"DOUGLAS GALTON,
"Capt. Royal Engineers."

## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I am sorry that "Y" has not expressed the ground of his dissent from my views more clearly. The few observations which I made in No. 1613 of your Magazine, still appear to me simple and correct. I do not perceive in what way the letter of "Y" affects them, whether favourably or not. In inability to comprehend each other we appear to be even; he cannot "understand how $Rv'$ can express a loss of power, R being the resistance of the ship at velocity $v$," and $v'$ the excess of the velocity of the propeller above that of the vessel. I, for my part, do not understand what he means by assuming, as he seems to assume, that the work done on the propeller is ever equal to that done by the resistance of the ship's bows. The whole of the third paragraph of the letter appears a most profound mystery: the fact is that the work done by the propeller *never* equals that done by the resistance, but always exceeds it by the quantity $Rv'$. And I may here say that $v'$ is most essential to the propulsion. I ought perhaps here carefully to avoid being dogmatical, as practical men as well as theorists have taken much pains to show the fact that a propeller works, or the possibility that it may work, even with negative slip; with respect to this I may be permitted to say, that I hold it capable of demonstration, that no propeller when working alone can work effectively with any but a positive slip. The slip of the paddle has, I believe, never been alleged to have been other than positive. Assuming this, I will just briefly state (at the risk of being deemed tedious) the steps by which I arrive at the conclusion that propellers, like the paddle-wheel and screw, work at a disadvantage in comparison with those modes of putting floating bodies in motion in which a fixed obstacle is used.

The velocity of the paddle is always greater than that of the ship: the resistance on the paddle is always equal to that on the

bows of the ship when there is uniform motion. Hence the work done on the propeller is greater than the work done by the resistance on the bows, by the product of that resistance, and the excess of the velocity of the propeller above that of the ship. This is so simple an argument that it does not need the assistance of mathematical notation to make it intelligible. "Y" may verify this for himself by making an experiment with a boat-hook and oar, observing how much more effectively he can set a boat in motion when shoving off with the former than when rowing with the latter.

To the fourth paragraph of the letter, I answer that I make no "supposition," and that the deduction made is a reasonable one and involves nothing to justify the note of admiration with which it concludes, as it is a mere common-place.

The fifth paragraph too is quite true; I should not have hesitated to adopt it myself if I could have seen what it has to do with the matter. If "Y" imagines me to have said that "the propeller" is *not* "the agent through which the power of the engine is made available *for* propulsion;" that "the velocity V or $(v + v')$ of the propelling area, and the work done by the engine," *are not* "regulated by the resistance to be overcome at a given speed of the ship," he has much misapprehended me. The last paragraph hardly requires any answer. I will say, however, that "ascertained facts," so far as I am acquainted with them, "bear out the assertion that a loss of power arises from the obliquity of the blades:" and no facts can prove what "Y" says they do. They would prove the contrary.

It is my conviction the estimate I formerly gave of the advantage of the direct over the oblique propeller is below the truth. Let it be understood that, when these are compared, the only distinction between them should be the inclination. A direct propeller, acting at a foot from the surface, must not be put in competition with an oblique one acting at a depth of fifteen or twenty feet.

I am, Sir, yours, &c.,

A MECHANIC.

## ON BOILER EXPLOSIONS.

*To the Editor of the Mechanics' Magazine.*

REPEATED reports of the explosions of boilers lead us to ask how long the lives of those who have to labour or reside near to them are to be placed in jeopardy by the carelessness of those whose place it is to attend them. As soon as the excitement of the moment is gone, we are again lulled into security. It is quite time, however, that the public, and especially the operatives connected with the various manufactories in which boilers are used, should be able to repose more confidence upon the attendants; and until the great amount of ignorance that prevails among that particular class is removed, there will be no safety. Such persons seem to be totally incapable of any other idea than that which is necessary to the mere feeding of coals to the fire; and the masters, in some places, have little or no more knowledge of a subject about which they ought to be so much concerned. To devise a remedy for the evil, would be a very difficult matter; however, in the first place, all the attendants (or firemen and engine-tenders) should undergo some kind of an examination, by qualified men, before their appointment is made. This is done in the naval steamers, and it is attended with good results. They ought to possess some mechanical knowledge, such as calculating the power of the lever, by which they would be enabled to judge of the danger they run, by placing different kinds of weights upon such lever. There have been various explanations given, from time to time, of the causes of boiler explosions; but these, when they are compared with each other, are often conflicting and contradictory. One person will come to the conclusion that when the water gets too hot, and the plate to nearly a red heat, that gas is instantaneously formed, and caused to explode with great force; while, on the other hand, another party will argue that the pressure of the steam increases so much in a very short space of time, that unless the safety-valves are loaded carefully to the pressure the boiler will sustain, and are made large, and well attended to, an explosion must be the consequence. With the latter view of the question I am inclined to coincide. There have, as I have before mentioned, been several mechanical remedies proposed; such as when the water gets too low, an apparatus may be brought into action to admit steam into the furnace to put out the fire, or reduce its action. There are also various forms of signal-whistles for the same purpose; some are found to be very useful, but others, again, are rendered useless by the stupidity or absence of the attendants. It sometimes happens that the best-formed safety-valve may be stopped in its action through neglect, as when sticking to the seat, &c., occurs: to avoid this, I would propose that the valves be made spherical, and rest upon a narrow seat, and that the weight be suspended by a rod in the interior of the boiler, the rod and weight being so encased that the attendant cannot interfere with it. At the bottom of the rod there

should also be a large surface-float to rest upon (or in) the water. The action of the water caused by ebullition against this float would cause a vibration of the rod, and prevent the valve adhering to the seat,* at the same time, being cased up in the interior of the boiler, it might be loaded to the pressure that the boiler would sustain, without risk of danger, at the same time being entirely out of the reach or designs of the attendant or fireman. Besides the valve above mentioned, there ought to be another, of sufficient area, loaded by a lever or other contrivance, and placed in such a position that it could at all times be seen. The valves generally placed on the outside are locked up, and are liable, from this cause, to escape the attention necessary to keep them in order. I would also remark, that the masters using boilers in any district ought to form themselves into an association, and appoint a practical engineer to make an examination of the attendants, as before stated, and also to make a frequent examination of the boiler, and report to the association, with any other information or suggestion called for in each peculiar case; and under no circumstance whatever should any master be allowed to work the boiler after a report had been given as to its dangerous state until some repairs had been duly made.

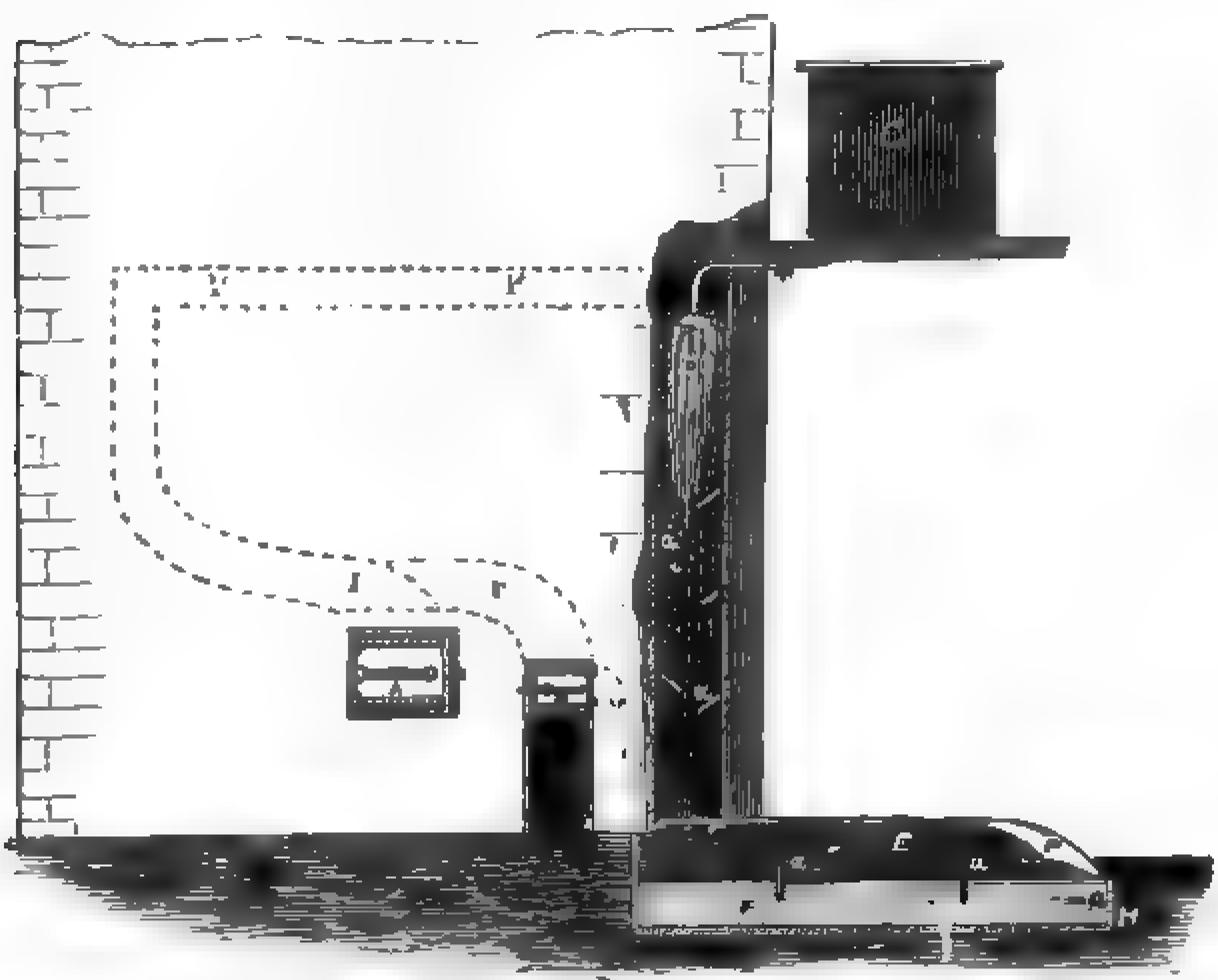
I am, Sir, yours, &c,

ENGINEER.

Manchester, Aug 16, 1854.

## MANLEY'S PATENT SMOKE CONSUMING FURNACE.

THIRTEEN years ago a correspondence was published in the *Mechanics' Magazine*, (vol. xxxiv.), relating to the comparative merits of Mr. C. W. Williams' patent method of *preventing* the formation of smoke, and Mr. Armstrong's revival of Jeffrey's patent arrangement for suppressing smoke by means of a shower of water. It is therefore a curious coincidence that we are again called upon to bring almost simultaneously before our readers a new work by Mr. Williams, in which his invention is completely described and judiciously defended, and an improvement upon previous methods of applying streams of water to furnaces for the purpose of preventing the emission of



smoke. We shall, however, reserve our remarks on the work alluded to for a future article, and at present confine ourselves to a statement of the improvement just mentioned. The accompanying engraving represents an elevation, partly in section, of a

* A safety-valve arrangement exactly resembling that described by our correspondent was registered by Mr. Nasmyth in 1851, and described by us in vol. liv., No. 1451, page 430. ED. M.M.

furnace, fitted according to Mr. Manley's arrangement, at the works of Messrs. Cubitt and Co., Gray's Inn-road. A is the old, and B, the new door of the furnace, the former being now blocked up; C is the cistern which supplies the water to the vertical shaft, D, which leads from the flue, I′ I′, down to the water-tank, F. I is the old flue, which formerly led (as shewn) from it into the vertical portion of I′ I′, which being continued upwards formed the chimney; this is now, however, quite cut off. The operation of the furnace is as follows:—When a fresh charge of fuel is thrown in through the door, B, smoke is produced, and traversing the flue, I′ I′, enters the vertical shaft, D, down which it is carried by the action of the water which streams from the cistern, C, through a pipe terminating with a rose. The denser portions of the smoke are thus precipitated into the water in the tank, F, from which they pass into a sewer, while the lighter rise and are received into the pipe, P, which conducts them back to the entrance of the furnace. The action of the water is rendered more effective by the projections, *a a*, which compel the gases to travel in a circuitous path.

The working of the furnace is represented as highly satisfactory by the persons in charge of it, and steps, we believe, are being taken for avoiding waste, by securing the lamp-black which at present passes away into the sewer, and which is of a superior quality. The application of the arrangement has effected a great reduction in the quantity of fuel required for the furnace, in which a much more equable temperature is sustained than could before be kept up.

## IMPORTANT IMPROVEMENT IN THE MANUFACTURE OF METALS.

A very important and curious improvement in the manufacture of iron and other metals has recently been announced in the *Birmingham Journal*. The writer of the announcement is a gentleman of high scientific attainments, or we should have attached but little importance to it, on account of the peculiar character of the invention, which consists in employing a *liquid purifier*, the composition of which is as yet known only to the inventor, Mr. B. L. Phillips, of 15, Coburg-place, Upper Kennington-lane, London. On inquiry, we find that that gentleman has made numerous experiments on cast-iron at one of the largest iron-foundries in Birmingham, and the result, we are informed, has been, that the liquid purifier, which is used without the smallest danger, is proved to be capable of imparting to the metal superior strength and toughness. At this foundry the liquid has been introduced at least twenty times into the ladle whilst the iron was running from the cupola. Several bars were made in this way and others in the ordinary way, both of the same size and metal; on being tested for strength, it was found that the purified iron was fully 16 per cent. stronger. Some pig-iron prepared in the same way was afterwards put back in the cupola, and on being re-melted, and cast again into pig, it was found to be further improved. In the cupola the liquid was introduced four times, and was always found to act powerfully upon the metal, which it purifies in the cupola; and when the metal was run into the ladle, there was little to skim from the top. "The fireman asserts," says the *Mining Journal*, "that he clears out the cupola in half the usual time, and with little labour, and that the moulders generally notice the next day that the first three or four shanks of metal drawn mostly partake of the properties of the previous day's operation. Whether introduced into the ladle or into the cupola, the castings made with the liquid are always cleaner, better, and stronger. The price that Mr. Phillips has fixed for this useful preparation cannot fail to render the adoption of it a source of economy to the trade generally. To the public, also, it will prove very beneficial, by producing good sound castings instead of the many defective ones which the manufacturer is compelled to send out, in consequence of the very bad pig-iron which is now produced from many of the blast furnaces, and in which from 20 to 30 per cent. of cinder and other dross and rubbish is frequently found. We understand it is Mr. Phillips's intention to introduce this liquid into the puddling and blast furnaces, and from what has been shown of the effects in the cupola, where only a small quantity of liquid was introduced, there is little doubt of its success. On behalf of the iron trade generally, we call on all the respectable ironmasters to give it a fair trial, which we have Mr. Phillips's authority to state would be done on his part gratuitously, as have been all the experiments he has hitherto made." The originator of the method has received numerous communications from ironfound-

ers and others in various parts of the kingdom, to all of which we have reason to know he has replied satisfactorily, giving reference to the firms where the experiments above referred to were instituted.

It must not, however, be supposed that the liquid purifier is applicable to the manufacture of iron only, as it has already been applied to that of copper and brass also, and has been found in these cases to bring up to the surface of the metal in the crucible or melting-pot (either in or out of the furnace) all the dross and impurities almost immediately, in consequence of which the castings formed are stronger, tougher, and more compact, and consequently better adapted to boring and turning than when the ordinary mode of fluxing is adopted. It is scarcely necessary for us to say that the influences which will be exerted by such an improvement as this, should it become fully established, will extend to every branch of our manufactures.

We are pleased to find that Mr. Phillips has been very cordially welcomed by many of the Birmingham firms as a benefactor to the trade, and to the public also. He has had, of course, to encounter many prejudices, but the advantages derivable from the purifier are becoming rapidly appreciated. Among other establishments where the indefatigable discoverer has been, may be noticed the paper mills belonging to the highest civic authority of the borough of Birmingham, who received him with great kindness, and having listened attentively to his statement of the effects on metals of the mixture, and of what he proposed doing at the paper-mills, the worthy mayor at once went thither with him, and whilst the machine was in operation, Mr. Phillips introduced a small quantity of the liquid; in about a minute, we are informed, a piece of paper was produced of decidedly different texture to the bulk then making. This is not, of course, to be considered as a fair test or experiment, but merely as showing the extraordinary power of the liquid purifier, whether applied to hard or soft substances. Instances of its effect on other articles might be related, but enough is here shown to prove that various sources of our national prosperity are likely to derive advantage from its introduction into the factories at Manchester and elsewhere, to which, we understand, Mr. Phillips proposes to turn his attention as soon as he has firmly fixed the application of it in the metal trade.

We will conclude this notice by stating that we shall shortly revert to the subject, which must be one of much interest to our readers. Before we close, however, we think it right that we should call the attention of those who are charged with the erection of the new iron bridge at Westminster to this invention, and suggest the propriety of their testing its merits, with a view, should it be found valuable, to its adoption in the manufacture of the iron to be employed in that structure; Mr. Phillips having assured us that he is ready to supply the liquid at a small charge per ton.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

COLLETTE, CHARLES HASTINGS, of Lincoln's-inn-fields, Middlesex, gentleman. *An improved method of reducing ores.* (A communication.) Patent dated February 3, 1854. (No. 269.)

The patentee having placed the ore, together with coke, in a retort, the latter is then heated to redness, and the reducing gas or gases, such as hydrogen, carbonic oxide, or carburetted hydrogen, having been prepared, are introduced into the retort, and made to traverse the contents, the gaseous products being allowed to pass off.

NEWHOUSE, ROBERT BROCKMAN, of Uckfield, Sussex, surgeon. *Improved apparatus for conducting off the gases of combustion from open fire-places.* Patent dated February 3, 1854. (No. 270.)

The inventor provides a casing composed of plate-iron, or other suitable material, and of a length sufficient to project into the mouth of the chimney when set vertically above the grate. This casing at bottom exceeds in width the grate to which it is to be applied, and it gradually contracts both in width and depth towards its upper end.

LONGMAID, WILLIAM, and JOHN LONGMAID, both of Beaumont-square, Middlesex. *Improvements in the manufacture of vegetable charcoal.* Patent dated February 3, 1854. (No. 273.)

This invention consists in employing wood sawdust, or other vegetable matter in a state of dust or subdivision, and in acting on the same with sulphuric acid and water. The liquid is then filtered off and the charred dust dried, and, if necessary, ground to a fine powder.

HOWARD, EDWARD, and DAVID PORTER DAVIS, of Massachusetts, United States. *Improvements in machinery for sewing cloth or other material.* (A communication.) Patent dated February 3, 1854. (No. 274.)

The inventor describes a method of forming the needle tubular, and placing the closing-slide within it, and of constructing a groove or thread-passage, the object of which is to support the thread and prevent it from "kinking or injurious springing."

MEEUS, PIERRE JOSEPH, of Paris, France, engineer. *Improvements in the manufacture of threads from or with gutta percha, and in ornamenting the same.* Patent dated February 3, 1854. (No. 275.)

*Claims*—1. The manufacture of gutta percha threads by cutting thin sheets of gutta percha into strips, and twisting such strips either singly, or two or more together, with the aid of heat and compression, so as to form round threads. 2. The manufacture of gutta percha threads by twisting or twining a strip or strips of gutta percha round a thread or core of textile material or metal, or by passing such thread or core through a solution of gutta percha. 3. The ornamenting of gutta percha threads by the direct application thereto of metal, leaf metal powder, or other substance in powder either before or after such threads have been woven or otherwise worked into fabrics.

MILLS, GEORGE, of Glasgow, Lanark, Scotland, gentleman. *Improvements in the construction of steam vessels, and in steering the same.* Patent dated February 4, 1854. (No. 277.)

*Claims.*—1. The construction of twin vessels of suitable form, with straight inner sides, and their combination in such manner as to constitute one vessel, with a water way through its centre. 2. The adaptation and application to such vessels of thwartship paddle-wheels for steering or manœuvring them.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in springs applicable to railway carriages and other uses.* (A communication.) Patent dated February 4, 1854. (No. 278.)

This invention "consists in sustaining the outer coil of a flat volute spring by a case, when this is combined with the application of the force in lines parallel or nearly so with the axis of the coil of the spring, by connecting the outer coil of the spring with one, and the inner coil with the other, of the two bodies to be kept apart with a required elastic medium."

BOYDELL, JAMES, of Anchor Iron Works, Smethwick, near Birmingham. *An improvement in the beds of reverberatory furnaces used for puddling iron.* Patent dated February 4, 1854. (No. 279.)

*Claim.*—The application of the refuse products of iron obtained in burning pyrites (for the manufacture of sulphuric acid and sulphur), in the making of the beds of reverberatory furnaces used for puddling iron.

LITTLE, WILLIAM, of the Strand. *Improvements in distilling or obtaining products from coals and bituminous substances.* Patent dated February 4, 1854. (No. 280.)

In carrying out this invention, the coals or bituminous substances are placed in a vessel, which is connected to a fire-place by a flue or passage, and also with a suitable condensing apparatus by another passage. Air is decomposed by passing through a red fire, and the products, alone or combined with steam, pass into the vessel and act upon the coals or bituminous substances to be distilled.

NEWALL, ROBERT STIRLING, of Gateshead, Durham, wire-rope manufacturer. *Improvements in setting up ships' rigging.* Patent dated February 4, 1854. (No. 281.)

*Claims.*—1. Forming the holes in the tongues of metal lanyards nearer together, or at a greater distance from each other than those in the two cheeks, for the purpose of enabling the tightening or setting up of ships' rigging to be adjusted to the nicety required. 2. The adaptation of a weighted lever to the screw employed for tightening or setting up ships' rigging in such manner as to measure or weight the strain exerted, and thus regulate the strain in proportion to that which the ropes are calculated to bear.

COLE, EDWARDS, of Hemming's-row, Westminster, leather case-maker. *An improvement in the frames of travelling bags.* Patent dated February 4, 1854. (No. 282.)

*Claim.*—Constructing the upper frames of travelling bags of angle iron, and connecting the top frames by means of joints, as described.

SULLIVAN, THOMAS, of Foots-cray, Kent, roller manufacturer. *Certain improvements in rollers and moulds used in making paper.* Patent dated February 6, 1854. (No. 283.)

*Claim.*—The manufacture of rollers and moulds used in the making of paper, with spaces or interstices therein for producing lines on the paper.

MEERE, AUGUSTE LOUIS NICHOLAS COMTE VANDER, of Paris, France. *The manufacture of artificial whalebone, or a substance capable of being employed as a substitute for whalebone and tortoiseshell.* (A communication.) Patent dated February 6, 1854. (No. 287.)

This invention consists in softening horn and rendering it flexible and elastic, like ordinary whalebone. The horns are cleansed from grease, split, opened out, and flattened in the ordinary manner, and then immersed for several days in a bath composed of five parts (by weight) of glycerine and 100 of water.

HEMSLEY, THOMAS and WILLIAM, of Melbourne, Derby, lace-manufacturers. *Improvements in the manufacture of looped fabrics.* Patent dated February 6, 1854. (No. 288.)

This invention relates to a previous one

patented in 1851, and consists in giving motion to the needle-bar, in dispensing with the depressing-bar and the three point bars, and in keeping the two rows of threads equally spaced and moved in opposite directions from selvage to selvage by means of two screws.

Graham, James Balie, of Glasgow, Lanark, North Britain, scientific lecturer. *Improvements in the production of printing surfaces.* Patent dated February 6, 1854. (No. 289.)

*Claims.*—1. A mode of producing printing surfaces by depressing portions of a compound surface or mass made up of pins, type, or pieces of metal or other suitable material. 2. A mode of producing surfaces by moulding gutta percha or other suitable material upon a compound surface made up of pins, type, or pieces of metal or other suitable material, portions of such surface having been depressed to correspond to the required pattern.

Duncan, Andrew, of Glen House, Denny, Stirling, North Britain, paper-maker. *Improvements in bleaching.* Patent dated February 6, 1854. (No. 290.)

*Claims.*—1. A mode of bleaching the materials capable of being used in the manufacture of paper, textile materials and other substances or fabrics, by the agency of a separately heated bleaching liquid. 2. The application and use in bleaching of a bleaching liquid or agent separately heated to 110° Fahrenheit's scale, or to a temperature not far from this point. 3. A method of bleaching without the use of steeps.

Neilson, Walter, of Glasgow, Lanark, North Britain, engineer. *Improvements in blowing engines.* Patent dated February 6, 1854. (No. 291.)

*Claims.*—1. A mode of constructing blowing engines wherein the piston of the vertical blowing cylinder is actuated by a revolving shaft placed under the blowing cylinder, the shaft being driven by a steam engine directly, or through the medium of geared wheels. 2. A mode of constructing blowing engines, wherein the fly-wheels are placed on the shaft directly connected with or actually giving motion to the piston of the blowing cylinder.

Trumble, Peter, of Huddersfield, York, painter and gilder. *Improvements in paper hangings.* Patent dated February 6, 1854. (No. 292.)

This invention consists in manufacturing paper hangings with oil instead of water-colors.

Murdoch, James, of Staple-inn, Holborn, Middlesex. *An improved process for manufacturing paper.* (A communication.) Patent dated February 7, 1854. (No. 294.)

The inventor mentions certain improvements in the mode of manufacturing paper from "halfa spartum," or water broom.

Elce, John, of Manchester, machine-maker. *Certain improvements in machinery for spinning cotton and other fibrous materials.* Patent dated February 7, 1854. (No. 295.)

The improvements consist in constructing certain combinations of machinery applicable to Robert's self-acting mules, for regulating the winding on of the yarn from the bare spindle until the bottom of the cop is formed.

Poitiers, Edward, of Malden-terrace, Haverstock-hill, Middlesex, gentleman. *A new material for the manufacture of cordage, canvas, and linen, and generally as a substitute for hemp and flax.* Patent dated February 7, 1854. (No. 296.)

The material mentioned in the title is "the fibre of the leaflet of the palm-tree, 'Elais Guiniensis.'"

Olding, Henry, of Lambeth, Surrey, civil engineer. *Improvements in stoves and fireplaces.* Patent dated February 7, 1854. (No. 297.)

*Claim.*—The adaptation to stoves and fireplaces of an open back or grating, in combination with a flue or chamber behind it, communicating with the ashpit, and fitted with a stationary or adjustable throat-piece or valve at or about the level of the firegrate, for the purpose of regulating the admission of air.

Duvillier, Alphonse François Damiens, of Rue du Bouloi, Paris, France. *A new system of remontoirs or apparatus for winding up watches without a key.* Patent dated February 7, 1854. (No. 300.)

These improvements consist "in the application of a clutch-box or otherwise striated wheel (or a wheel with a roughened face) to the spindle of the remontoir or winding-up apparatus of watches and pocket chronometers."

Taylor, James, of Carlisle, Cumberland, engineer; Isaac Brown, of the same place, merchant and field seedsman; and John Brown, of Oxford-street, Middlesex, silk mercer. *Improvements in the charring of vegetable and animal substances.* Patent dated February 7, 1854. (No. 302.)

In carrying out this invention, peat or other substance is passed through a heated chamber on trays, made of perforated iron plates, or of a web of wire-cloth attached to endless chains, and is moved along in such manner, and at such speed, that it may be dried in its passage. The dry material is then put into a vertical retort, enclosed in brick-work, or a casing of flags, formed of well-burned fire-clay, and hooped with wrought-iron hoops, the heat being applied round and through the retort.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in bleaching textile fabrics.* (A communication.) Patent dated February 7, 1854. (No. 303.)

These improvements consist in so arranging a series of rollers in a vat, that a considerable number of continuous sheets of cotton or linen fabric may be simultaneously drawn through the vat, the object being so to present the fabric to the bleaching or boiling solutions, that it may be thoroughly acted upon by them.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for heckling flax and other fibrous materials.* (A communication.) Patent dated February 7, 1854. (No. 304.)

This improved machine has combined in it heckle-drums, cylinders, or sheets, running independently of each other at varying speeds and in opposite directions.

BIANCHI, BARTHELEMY URBAIN, of Paris, France, civil engineer. *Certain improvements in preventing accidents on railways.* Patent dated February 7, 1854. (No. 305.)

*Claims.*—1. The constructing and applying electrical apparatus in conjunction with a line wire and apparatus acted upon by the passage of the trains, so as to indicate at the stations the advance and approximate positions of the trains. 2. Constructing and arranging electrical apparatus at the stations and at the positions of the watchmen or signal-men, so that such several apparatus may be traversed by a continuous current of electricity, and be capable of communicating signals from any one of such apparatus or instruments to all the others by momentarily or temporarily interrupting the continuity of the wire one or more times in succession; also arranging such apparatus so as to display signals capable of attracting the attention of the engine-driver or other person on the train. 3. A mode of combining these various apparatuses, so as to be worked by one and the same galvanic battery.

KNOCKER, GEORGE WIGZELL, of Bushy Ruff, Dover, Kent, gentleman. *A new method for producing rotatory motive power by means of water.* Patent dated February 8, 1854. (No. 307.)

Mr. Knocker says, "When water in a tube or cylinder, acted on by a force, is in communication with a larger moveable surface in a closed vessel filled with water, the effect is relative to their respective areas. Hitherto motion has only been obtained by this means at intervals and in a lineal direction. The design of this invention is to produce in the same way a continuous motion, available in all cases where motive power is required."

PERRY, JOHN, of Leeds, York, machinist. *An improved drilling machine.* Patent dated February 9, 1854. (No. 308.)

This machine is composed of a revolving face-plate mounted upon a horizontal axis, to which plate the article to be drilled is to be affixed, and around the circumference of this plate a worm-wheel is formed, in gear with which is a worm or screw, actuated when required by means of a small winch-handle, the motion of which is transmitted to the worm by means of a train of spur-wheels. In connection with the handle is a small disc, having cut in its periphery a notch or notches, into which the end of a spring falls as the disc revolves. The drill is mounted in a revolving socket placed, and capable of sliding, in a horizontal direction, being brought forward to its work by means of a small lever, and withdrawn by a spring.

RAMSBOTTOM, JOHN, of Longsight, near Manchester, engineer. *An improved hoist for raising and lowering railway rolling stock and other articles.* Patent dated February 9, 1854. (No. 309.)

This invention consists in the direct application of steam to the working of a ram or piston acting on water or other incompressible fluid in such manner that in a hoist with two platforms each stroke of the piston causes one platform to ascend while the other descends the entire lift; also, in the application of similar improvements to the working of a hoist with a single platform or with more than two platforms.

DALTON, JOHN, of Hollingworth, Chester, calico printer. *Improvements in the construction of bowls or cylinders employed in printing and other processes, and which improvements may also be adapted to other mechanical appliances.* Patent dated February 9, 1854. (No. 310.)

This invention consists in the construction of bowls, cylinders, or other cylindrical mechanical appliances, of segments of wood having their fibres "placed vertically to the centre." (!)

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of Finsbury, London. *Improvements in fire-arms.* (A communication.) Patent dated February 9, 1854. (No. 312.)

*Claim.*—The use of a moveable priming piece for placing the percussion cap upon the nipple by means of a stud or knob that may be worked by the thumb.

VOUILLON, FRANCOIS, of Prince's-street, Hanover-square, gentleman. *A new process of protecting the silvering of looking-glasses.* (A communication.) Patent dated February 9, 1854. (No. 313.)

This invention consists in covering the back of the silvering and edges of looking-glasses with a tissue made to adhere thereto

and rendered waterproof by means of varnish and paint or of caoutchouc.

SAMUEL, JAMES, of Great George-street, Westminster, civil-engineer, and ALEXANDER WOODLANDS MAKINSON, of New Palace-yard, Westminster, civil-engineer. *Improvements in drying flax, straw, and other fibrous substances.* Patent dated February 9, 1854. (No. 314.)

*Claims.*—1. The drying of flax, straw, and other fibrous substances, by placing them in proximity to heated surfaces, and at the same time causing a current of heated air to pass through or in contact with the same by mechanical means. 2. Drying the substance as above described, giving, at the same time, a rotary motion to the substances.

BOILEAU, EUGENE, of Holford-place, Clerkenwell, Middlesex, typographical engraver. *Improvements in producing raised printing surfaces.* Patent dated February 9, 1854. (No. 316.)

The object of this invention is to produce plain and coloured ornamental designs, chiefly checks and plaids, or Tartans, upon paper and other materials, by the use of types which will admit of being arranged in various ways to produce different patterns.

MEEUS, PIERRE JOSEPH, of Paris, France, gentleman. *Improved apparatus for planting grain and seeds, depositing manure, and for performing operations connected therewith.* (A communication.) Patent dated February 9, 1854. (No. 318.)

This invention consists of a series of apparatus for planting or sowing at a simultaneous operation, in the midst of an appropriate manure, all kinds of grains and seeds in tufts or masses quadrangularly at regular intervals—for covering over the deposited seeds—for weeding—for dressing a second time—and for earthing up the growing plants in longitudinal and transverse lines.

BROWN, DAVID, of Smethwick, Stafford, machinist, and JOHN BROWN, of West Bromwich, Stafford, roll turner. *An improvement or improvements in the construction and manufacture of axles for railway and other carriages.* Patent dated February 10, 1854. (No. 320.)

Manufacturing axles for railway and other carriages, by welding together certain parts of which the same are composed, by rolling between three or more rollers rotating in the same direction, the axis of the axle being parallel to the axes of the rollers during rolling. (We shall probably give an illustrated description of this invention shortly.)

DRAY, WILLIAM, of Swan-lane, London, agricultural implement maker. *Improvements in the construction of portable farm and other buildings, parts of which improvements are applicable to the construction of cart and wagon bodies and other structures.* Patent dated February 10, 1854. (No. 322.)

*Claim.*—Constructing frames for portable farm and other buildings or structures, and also the frames for wagons, carts, phætons, gigs, and other vehicles, of metal tubes.

HUNT, SAMUEL, and THOMAS MORRIS, both of Longeaton, Derby, builders. *Improvements in covering the roofs of buildings with slates tiles, or other material.* Patent dated February 10, 1854. (No. 323.)

*Claim.*—Certain improved methods of covering roofs with slates, tiles, or other materials, whereby the roofs are formed of only one thickness of covering, except at those parts where the edges of the covering materials overlap or are covered by the fillets or rolls as described.

HINE, BENJAMIN HORNBUCKLE, and ANTHONY JOHN MUNDELLA, of Nottingham, manufacturers, and LUKE BARTON, of Hyson-green, Lenton, Nottingham, mechanic. *Improvements in the manufacture of knitted fabrics.* Patent dated February 10, 1854. (No. 325.)

This invention consists in the adaptation of a narrowing apparatus to the original stocking frame, such frame and apparatus being actuated by rotary motion. By it the inventors are able to make two, three, four, or any other number of narrowed or fashioned stockings that practice may prove to be most profitable at one time. The improvements are also applicable to the manufacture of other articles, such as shirts, drawers pantaloons, half-hose, &c.

YOUNG, JAMES, of Glasgow, in the county of Lanark merchant. *Improvements in gas-making.* Patent dated February 10, 1854. (No. 326.)

The inventor sets the retorts vertically in the oven, with their lower ends nearly on a level with the furnace-bars and causes the coal with which they are charged to descend slowly and continuously from the upper to the lower end of each retort, and be there discharged regularly in the state of coke, in any suitable manner. He also places the passage for the exit of the gas at or near the lower end of the retort, in order that the hydrocarbon vapours formed in the upper parts of the retort may be exposed in passing to the outlet to the higher temperature of the lower parts containing the nearly exhausted coal, and be thereby converted into permanent gas, before they finally pass off from the retort in which they are generated.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ROGERSON, JAMES, SAMUEL ROGERSON;

and James Rogerson, junior, of Manchester, Lancaster, embossers. *Improvements in machinery or apparatus for embossing, cutting, and perforating textile fabrics.* Application dated February 3, 1854. (No. 271.)

In carrying out these improvements, cutting edges are formed on a metallic embossing roller which carries the engraved pattern; such cutting edges corresponding in their outline to the pattern of the perforations required. Between this roller and a plain pressing roller the fabric to be operated upon is passed, so that the embossing, cutting, and perforating operations will be simultaneously performed.

Lannes, Alfred, Marquis of Montebello, proprietor and champagne wine merchant, of Mareuil-sur-Ay, France. *An improved propeller applicable to the navigation of ships and other vessels.* Application dated February 3, 1854. (No. 272.)

This propeller consists of submerged cylindrical sectors mounted upon a vertical or nearly vertical axis, which imparts to them a vibratory movement through an arc of a circle, causing the radiating or plane surfaces of the sectors to produce an effect analogous to that of oars.

Gosling, William, of Edward-street, Woolwich, Kent. *An invention for the purpose of preventing collisions on railways, which he has designated "Gosling's Railway Danger Signal."* Application dated February 4, 1854. (No. 276.)

This signal consists of a bell fixed on a locomotive engine or tender, and rung by a lever and pendulum, protected by springs and padding, and acted upon by a stop fastened upon the sleeper of the railway.

Deyres, Dominiques, engineer, of Bateman-buildings, Soho-square, London. *Certain improvements in drilling or boring.* Application dated February 6, 1854. (No. 284.)

The inventor describes a drilling-tool composed of a frame, a table on which the article to be drilled is to be placed, a trigger through which the power is applied, bevil-wheels to change the speed of the drill-stock by means of a spur, a pinion, a handle which raises or lowers the table by means of a rack, and a screw for keeping the drill home to its work.

Firth, Benjamin Wrigley, of Oldham, Lancaster, auctioneer and appraiser. *Improvements in the method of stopping railway-trains, of working breaks on railway and other carriages, and of communicating signals from one part of a railway train to another.* Application dated February 6, 1854. (No. 285.)

The inventor proposes to place an additional valve on the engine, in any convenient position, to act as a signal whistle, and to convey a communication from the said valve, by wire or other suitable material, along each carriage, &c., &c.

Moseley, John Warburton, of Heathfields, Stafford, doctor of medicine. *An improved method of uniting glass and argilaceous cylinders and tubes for conducting water and other fluids.* Application dated February 7, 1854. (No. 293.)

The inventor rolls gutta percha and caoutchouc round the extremities of the tubes which are brought together, having first sufficiently softened these substances by the application of heat, and then binds them with a wrapper of cord.

Curtis, William Joseph, of Birchin-lane, London, civil engineer. *An improved railway signal, especially adapted as a danger-signal.* Application dated February 7, 1854. (No. 298.)

The inventor attaches to the ordinary fog or exploding signal (or a case containing a detonating mixture placed upon the rail, so as to be exploded in the ordinary way by a wheel of the train passing over it,) a slow match or communicator of ignition, connecting the same with a Roman candle, or other fire-work, fitted upon a staff, so that it may be stuck in the ground by the side of the rail.

Bellford, Auguste Edouard Loradoux, of Holborn, London. *Improvements in the manufacture of artificial stone.* (A communication.) Application dated February 7, 1854. (No. 299.)

These improvements consist in adding to the raw material, such as sandy and earthy substances, from which artificial stone is generally formed, after it has been fused, chilled, and pulverized in the usual way, a certain quantity of unbleached wax, so as to render the powder cohesive and capable of retaining the forms given to it by moulding, carving, or any other method.

Pope, Abraham, of Edgeware-road, Middlesex. *Improvements in machinery for crushing, grinding, amalgamating, and washing quartz or matters containing gold.* Application dated February 7, 1854. (No. 301.)

The quartz or matters to be ground are placed in a hopper with quicksilver and water, and these matters descend and are acted on first by a pair of crushing grooved rollers, and then pass between two rollers having different surface speed, from which they again descend and are further ground and amalgamated by being passed between horizontal grinding surfaces.

Rees, Edward Thomas, of Prospect-place, Swindon, Wilts, draughtsman. *Improvements in pressure slide-valves in steam engines, to be called the "anti-pressure valve."* Application dated February 8, 1854. (No. 306.)

These improvements consist in forming on such valves a casting to receive a ring of India-rubber.

MOORHOUSE, HENRY, of Denton, Lancaster, tailor. *Improvements in part of the machinery or apparatus used in preparing cotton, wool, or other fibrous materials to be spun.* Application dated February 9, 1854. (No. 311.)

Instead of the coiler or plunger which are used to receive the slivers from the drawing or other frames, the inventor proposes to feed the slivers from the bottom of the cans, keeping them pressed down during the operation of filling.

TOURNAY, GEORGE, of Newington Causeway, Surrey, gentleman. *Improvements in obtaining motive power.* Application dated February 9, 1854. (No. 315.)

Obtainment of motive power by supplying steam directly to a wholly or partly encased wheel, on which are placed a series of cogs or projections upon which the steam acts, and then passes off by any convenient arrangement of exhaust pipes.

LYTE, FARNHAM MAXWELL, of Florian Torquay, Devon. *Improvements in apparatus for ascertaining the depth of water.* Application dated February 9, 1854. (No. 317.)

This apparatus consists of a piston placed in a suitable cylinder or vessel, and pressed outwards by a spring, while, by means of a piston-rod, the extent to which the spring is compressed is indicated on a graduated scale.

DUCK, WILLIAM, and WILLIAM WILSON, of London-road, Southwark, metal merchants and manufacturers. *An internal gas-heating apparatus.* Application dated February 10, 1854. (No. 321.)

This invention consists in "The application of gas as the heating agent, which may be introduced into the interior of the article required to be heated by means of ordinary or flexible gas tubing or otherwise, and applied to the inner surface of the article to be heated by means of one or more gas jets or burners."

ALLCOCK, THOMAS, of Ratcliffe-on-Trent, Nottingham, agricultural implement manufacturer. *Improvements in machinery for cutting straw and other vegetable substances.* Application dated February 10, 1854. (No. 324.)

This invention consists in placing the gearing-wheels of such machines within the frame, so that they may be covered with a box; in employing a lever and double pinion-wheel for cutting different lengths of chaff, &c.; in fitting the top roller so that it may rise or fall; and in causing the end of the shaft attached to this roller to work in a universal joint.

## PROVISIONAL PROTECTIONS.

### *Dated May* 30, 1854.

1193. Richard Tomlinson, of Sale, Chester, commercial traveller. The application of a new material or fabric to the manufacture of plasters for medical or surgical purposes.

### *Dated July* 20, 1854.

1591. Richard Roberts, of Manchester, engineer. Improvements in machinery for preparing to be spun cotton and other fibres.

### *Dated July* 21, 1854.

1600. Toussaint Delabarre, merchant, of Grenelle, near Paris, France, and Leon Bonnet, gentleman, of the same place. The preservation of meat in its natural state and without being cooked.

### *Dated July* 24, 1854.

1624. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and George Payne, of the same place. Improvements in distilling fatty and oily matters.

### *Dated July* 25, 1854.

1627. Francis Preston, of Manchester, spindle and flyer-maker. Certain improvements in machinery for preparing cotton and other fibrous materials.

1629. William Grundy, of the firm of John and Edmund Grundy, of Bury, Lancaster, woollen manufacturer. Certain improvements in the manufacture of drugget. A communication.

1633. Thomas Bell, of Don Alkali Works, South Shields, and Henry Schòlefield, also of South Shields. Improvements in the manufacture of borax.

1635. Julius C. Hurd, of Medway, Worcester, Massachusetts, United States of America. An improved machine and process for picking, burring, and cleaning cotton, wool, and for tearing up and reducing old fabrics to be re-spun.

### *Dated July* 26, 1854.

1637. John Lamacraft, of Westbourne-grove, Middlesex, gentleman. Improvements in envelopes or means for securing letters, notes, and similar documents.

1639. William Church, of Birmingham, Warwick, civil engineer, and Samuel Aspinall Goddard, of Birmingham, merchant and gun manufacturer. An improvement or improvements in ordnance.

1641. John Chillcott Purnelle, of Tachbrook-street, Pimlico, Middlesex. Improvements in obtaining and applying motive power.

1643. Louis Christian Koeffler, of Rochdale, Lancaster, bleacher and dyer. Improvements in finishing or polishing yarns or threads.

1645. Thomas Huckvale, of Choice-hill, near Chipping Norton, Oxon. Improvements in machinery for gathering crops.

### *Dated July* 27, 1854.

1651. George Mumby, of Hunter-street, Brunswick-square, Middlesex, mechanical draughtsman. Improvements in bearings and in the prevention of friction.

1655. Samuel Varley, of Stamford, Lincoln, engineer. Improvements in the construction of reaping-machinery.

1657. Samuel Frankham, of Greenland-place, Judd-street, Middlesex, engineer. An improvement in the construction of furnaces.

1659. Henry Wickens, of Tokenhouse-yard, London, solicitor. Improvements in the means of giving signals on railways, and for other purposes.

1661. Alexander Law, of Glasgow, Lanark, iron-

founder. Improvements in cranes, or lifting and lowering apparatus.

*Dated July* 28, 1854.

1663. Adam Guild, of Salford, Lancaster, engineer, and John Pendlebury the younger, of Manchester, in the same county, bleacher. Improvements in apparatus for scouring or bleaching.

1665. Richard Johnson, of Manchester, Lancaster, wire manufacturer. Improvements in coating and insulating wire.

1667. Amable Hippolyte Petit, of Paris, France, gentleman. An improved mode of joining pipes.

1669. James Gilbertson, of Hertford, Herts. An improvement in supplying air above the fuel in furnaces.

*Dated July* 29, 1854.

1675. Gustave Emile Bernard Collasson, gentleman, of Paris, France. Certain improvements in the means for arresting or checking the progress of trains on railways. A communication.

1677. John Fawcett, of Gateshead, Durham, chemist. An apparatus for regulating and economising the consumption of gas generally, but more particularly when employed for the purposes of illumination.

1681. Henry Walduck, of Warwick-court, Gray's-inn. Improvements in propelling vessels.

*Dated July* 31, 1854.

1685. Henry Green, of Liverpool, Lancaster, whitesmith and ironmonger. Improved apparatus applicable to the hanging of doors, gates, and windows, and for closing or holding open the same when required.

*Dated August* 1, 1854.

1689. Edward Gillman, of Twickenham, Middlesex, gentleman. Improvements in the manufacture of papier mache and other similar articles from certain vegetable substances.

1691. Thomas Evans, the younger, of Belmont-terrace, Lewisham, Kent, gentleman. Certain improvements in the rigging of ships, and all other vessels using or carrying sails, whether propelled by steam or otherwise, or on whatsoever sea, river, or other water navigated.

1693. John M'Gaffin, of Liverpool, Lancaster. An improvement in the manufacture of sheet metal pipes.

1695 Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for dressing flax, hemp, and other like fibrous substances. A communication.

1697. John Simon Holland, of Woolwich, Kent, engineer. Improvements in locks.

*Dated August* 2, 1854.

1699. Samuel Lees, of Salford, Lancaster, manufacturing chemist. Improvements in machinery or apparatus to be used in purifying gas for illumination.

1701. Cléo Chevron, of Paris, mechanician. Improvements in looms for weaving.

1703. Paul Garavaglia de Soresina, of Bedford-row, Middlesex. Improvements in treating flax and hemp.

*Dated August* 3, 1854.

1705. William Rye and William Crowther, both of Oldham, Lancaster, engineers. Improvements in steam engines.

1707. William Gossage, of Widnes, Lancaster, manufacturing chemist. Improvements in the manufacture of certain kinds of soap and other detergent compounds.

*Dated August* 4, 1854.

1709. Louis Player Miles, of Ravensbourne-park, Lewisham, Kent, gentleman. Improvements in the construction of locks.

1711. Samuel Lawrence Taylor, of Cottonend, Bedford. Improvements in constructing and arranging the beaters and dressing machinery of thrashing machines.

1713. Alfred Kortright, of James-street, Adelphi, Middlesex, Commander in the Royal Navy. Improvements in marine and surveying compasses.

*Dated August* 5, 1854.

1715. Auguste Boissonneau, of Paris, France, ocularist. Improvements in artificial eyes.

1717. Charles Frederick Stansbury, of the firm of Nourse and Co., Cornhill, London. Improvements in locomotive and steam boiler furnaces. A communication from Jonathan Amory and William Parrott, both of Boston, Massachusetts, United States of America.

1719. Charles Frederick Stansbury, of the firm of Nourse and Co., of Cornhill, London. Improved air-tight vessels. A communication from Robert Arthur, of Washington, United States of America.

1721. James Gathercole, of Eltham, Kent, envelope manufacturer. Improvements in bordering, or producing devices upon the edges of envelopes, letter paper, or other articles of stationery.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1756. Thomas Lawrence, of Birmingham, Warwick, manufacturer. Improvement or improvements in the manufacture of bayonet blades, and in machinery or apparatus to be employed for that purpose. August 11, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August* 22*nd*, 1854.)

857. Edward Briggs. Improvements in machinery and apparatus for finishing yarn and thread.

866. Arthur Hawker Cox. Improvements in coating pills and boluses.

869. James Griffiths. An improved portable measuring instrument.

873. Thomas Lawes. Improvements in protectors for the head. A communication.

884. Benjamin Fullwood. Improvements in the manufacture of cement.

893. Charles Watt. Improvements in bleaching hemp, flax, and other fibrous substances.

898. Jean Daniell Pfeiffer. Improvements in bookbinding.

922. William Britton Stephens. Improvements in lamps. A communication.

925. Pierre Jean Felix Mouchel. Certain improvements in melting, and in treating the ores and metals.

933. David Buddo. A magnetic weather-gauge, to give warning of the approach of gales and storms, &c.

986. Robert James Maryon. Certain improvements in the construction of and manufacture of anchors.

988. Desiré Plisson. Certain improvements in chemical condensing apparatus.

1011. Vincent Wanostrocht. Improvements in the construction of cannon and in projectiles to be used therewith. A communication.

1021. Charles Cammell. Improvements in buffer, draw, and bearing springs for railway carriages, and in the mode of, or apparatus for making the same.

1125. Auguste Edouard Loradoux Bellford. Certain improvements in looms for weaving. A communication.

1145. John Biggs. An improvement in the mariner's and other compasses, by isolating and rendering them insensible to the disturbing influence of local attraction of iron, steel, and other bodies.

1272. Thomas Greenshields. Improvements in railway chairs.

1280. William Edward Newton. An improved manufacture of bonnets and other coverings for the head. A communication.

1366. James Leadbetter, William Wight, and Thomas Davis. Improvements in machinery or apparatus for raising water and other fluids.

1350. Frederick Braithwaite. Improvements in constructing suspension-bridges, roofs, and coverings.

1412. Andrew Smith. Improvements in the manufacture of certain kinds or descriptions of wire and other ropes and strands.

1427. William John Bi-seker. A new or improved method of labelling bottles and such other vessels or articles as require or may require labelling.

1447. John Wilder. Improvements in agricultural rollers and clod crushers.

1449. Benjamin Walters. Improvements in spindles for locks and latches, and in the means of adjusting knobs to the same, to suit any thickness of door.

1473. Joseph Burch. Certain improvements in marine and other steam engines.

1514. Edwin Wolverson. A new or improved lock.

1551. James Derham. Improved machinery for combing wool and other fibrous substances.

1585. Jonas Whiteley, John Slater, and William Henry Crossley. Improvements in machinery or apparatus for preparing and spinning wool and other fibrous substances.

1591. Richard Roberts. Improvements in machinery for preparing to be spun cotton and other fibres.

1595. Francis Whitehead and William Whitehead. Improvements in safety-lamps.

1598. Thomas Chambers, junior. Improvements in machinery for distributing manure.

1617. John Bainbridge. Improvements in fire-grates, stoves, furnaces, and other similar contrivances.

1624. George Fergusson Wilson. Improvements in distilling fatty and oily matters.

1625. Auguste Edouard Loradoux Bellford. Certain improvements in kneading-machines. A communication

1632. Peter Spence. Improvements in obtaining sulphur from iron pyrites, and other substances containing sulphur, and in apparatus for effecting the same.

1633. Thomas Bell. Improvements in the manufacture of borax.

1634. William Stephens Garland and Josiah Glasson. A means of consuming smoke in furnaces.

1635. Julius C. Hurd. An improved machine and process for picking, burring, and cleaning cotton, wool, and for tearing up and reducing old fabrics to be re-spun.

1638. James A. Cutting. An improved process of taking photographic pictures upon glass, and also of beautifying and preserving the same.

1645. Thomas Huckvale. Improvements in machinery for gathering crops.

1653. William Beare Caulfield. The manufacture of brushes to be used in cleaning the small tubes of steam boilers, and for other purposes.

1661. Alexander Law. Improvements in cranes, or lifting and lowering apparatus.

1669. James Gilbertson. An improvement in supplying air above the fuel in furnaces.

1672. Edmund Burke and Alexander Southwood Stocker. Certain improvements in the manufacture of metallic tubes and such like articles.

1681. Henry Waldnck. Improvements in propelling vessels.

1693. John M'Gaffin. An improvement in the manufacture of sheet metal pipes.

1694. William Edward Newton. Improvements in the construction of repeating fire-arms. A communication.

1713. Alfred Kortright. Improvements in marine and surveying-compasses.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed August* 17, 1854.

1088. George Edward Dering.
1219. Joseph Robinson.
1227. Egmont Websky.
1249. Andrew Spottiswoode.
1253. William James Baillie.
1274. Thomas Bramwell.
1309. Charles Hargrove.
1314. William Gilbert Pidduck.
1316. Thomas Parramore.
1317. David Lowe.
1318. George James Hinde.
1338. David Bogue.
1347. Nathaniel Clayton and Joseph Shuttleworth.
1348. Willoughby Theobald Monzani.
1408. Charles Beale and John Latchmore.
1410. William Yates.

*Sealed August* 22, 1854.

449. Benjamin Joseph Green.
461. George Collier.
469. Frederick Westbrook.
470. Emile Chappuis.
476. John Morrell.
480. Ellis Marsden and John Marsden.
507. John Parry the younger.
509. Hugh Ellis and John Ellis.
510. Andrew Barclay.
615. Peter Armand Lecomte de Fontainemoreau.
619. Joseph Pimlott Oates.
656. François Loret-Vermeersch.
668. John Polson.
672. John Sheringham.
734. William Simpson.
1136. Henry S. Rogers.
1202. John Mac Farlane.
1234. Peter Armand Lecomte de Fontainemoreau.
1300. James Kite.
1303. John Davie Morries Stirling.
1368. George Simpson.

1369. John Marriott Blashfield.
1372. Auguste Edouard Loradoux Bellford.
1374. Auguste Edouard Loradoux Bellford.
1387. John Weild.
1399. John Thomson.
1403. Emile Hubner.
1413. Charles Hastings Collette.
1417. Charles Iles.
1425. Theophile Schlœsing.
1428. Corydon Stillman Sperry.
1433. Daniel Towers Shears.
1437. Henry George Gray.
1444. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*A Constant Reader.*—We thank you for your suggestion, of which we have availed ourselves, as you will see by the preceding pages of this number.

*(Another) Constant Reader and B. Ramsden.*—We regret that we are unable to furnish you with the information you require.

*W. Ross.*—Mr. H. Archer, of Great George-street, Westminster, patented the method now in use of perforating postage and other stamps, &c., in 1848. We do not remember whether the patent right was sold to the Government with or without reservation.

*R. H. Morris.*—Yours will probably be inserted in our next.

*W. A. Bendelow.*—You will find the nature of the invention you mention by referring to the "Abstracts of Specifications recently Filed" in the former part of this number.



## CONTENTS OF THIS NUMBER.



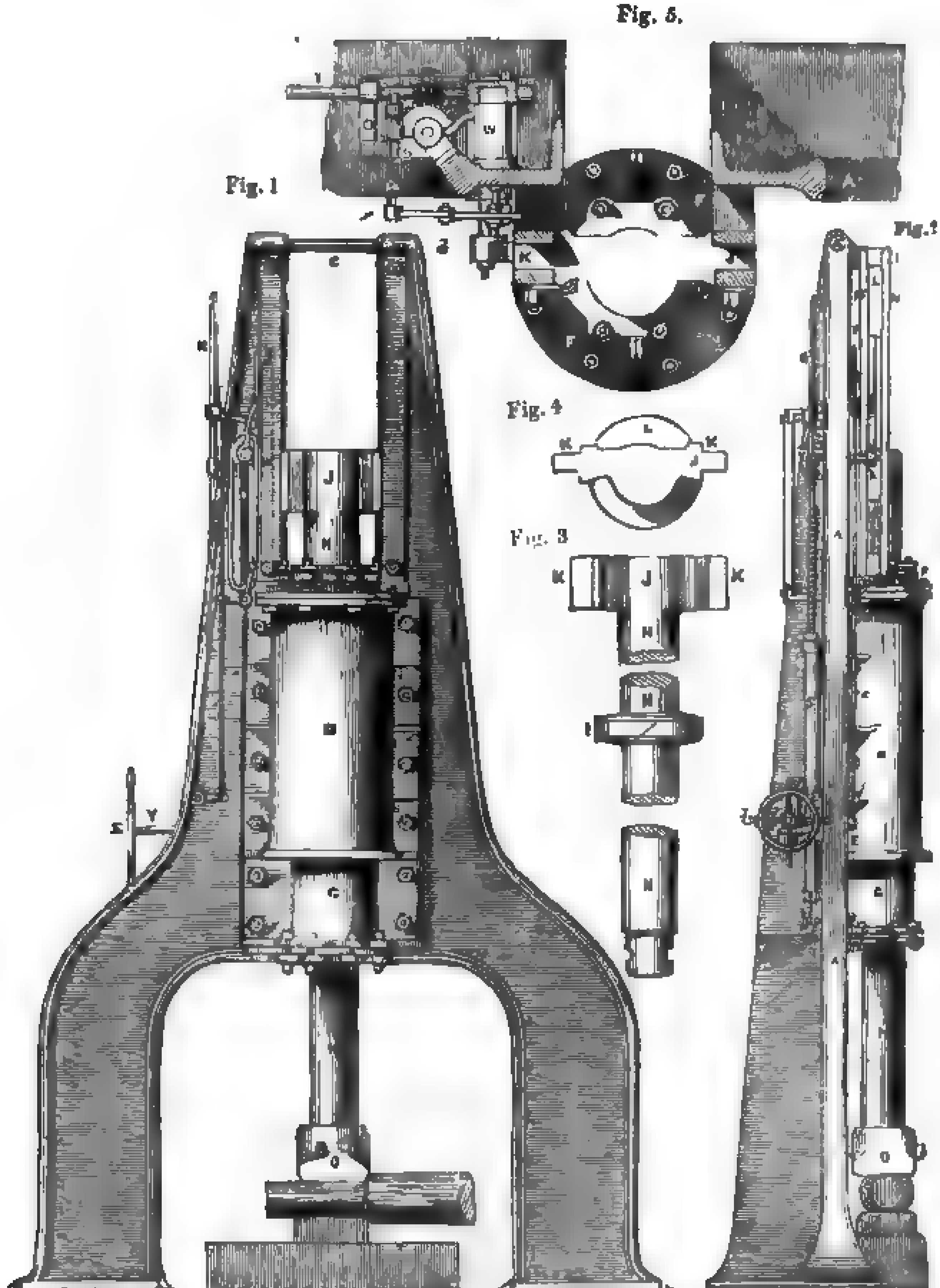
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

**No. 1621.]** SATURDAY, SEPTEMBER 2, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## MORRISON'S PATENT STEAM HAMMER.



## MORRISON'S PATENT STEAM HAMMER.

(Patent dated August 6, 1853.)

Mr. Morrison, of Ouseburn Engine Works, Newcastle-upon-Tyne, has patented an improved steam hammer, which will be found to possess many excellent qualities. The principal features of his invention consist in constructing the hammer, piston-rod, and piston, in one solid piece, which extends through a stuffing-box in the upper end of the cylinder, and forms a guide that works between the upper parts of the framing. By this arrangement the blows of the hammer are rendered very effective, and the machine is rendered very secure from fracture and derangement. Another important improvement has been effected by bringing the anvil and hammer clear of the framing, so that the material under operation can be worked far more conveniently and efficiently than would be possible if they were placed, as they usually are, directly between the vertical standards of the frame.

Fig. 1 of the engravings on the preceding page represents a front elevation of Mr. Morrison's hammer; fig. 2, a side elevation of it; figs. 3 and 4, detached views of the hammer-rod, &c.; and fig. 5, a horizontal section of the machine. A A are the standards, B, the foundation-plate, C, a stay uniting the upper portions of the frame, and D, the steam cylinder, which is formed with flanges, E E, by which it is bolted to the standards. F is the upper cylinder cover and stuffing-box, which are formed in two halves, and G is the lower stuffing-box, which is cast with the cylinder, so as to form the lower cover of it. H is the hammer-rod, on which is wrought the piston, I, and the guide, J, the ends, K K, of the latter working in the slots, L L, which are formed by attaching the pieces, M N, to the framing. O is the hammer-face; this is not fitted in place until the rod, H, has been passed down from above through the cylinder and lower stuffing-box, after which operation the two parts of the upper cover, F, are brought together and bolted, first to each other, and then to the cylinder.

The valve casing, P, is placed in the rear of the steam cylinder, D, and between the standards, A A, the steam valve being worked by the lever, Q, which is acted upon by a spring so disposed as to open the valve on the release of the lever. To this valve lever, Q, is jointed a rod, of which the upper part, R, screws into the lower part, S, in order that the length of the rod may be varied when a change in the length of the stroke is desired, and this rod, R S, is worked by means of a spanner, T, which again is actuated by the guide-end, K. The spanner, T, is fixed,—says the *Practical Mechanics' Journal*, from which we have, for convenience, gathered this description,—on a short horizontal spindle, U, carrying a short lever, V, the point of which enters a small slot formed in the rod, R, so that, when the spanner is pushed outwards by the ascending hammer bar, it causes the rod, R S, to descend and close the steam valve. The length of the hammer's stroke depends upon the position of the spanner, T, and for the purpose of varying this, the spindle, U, is carried in a bush, which slides in the vertical slot, W, formed in the standard. The spindle is moved up or down by the vertical rod, X, the lower end of which is screwed, and is passed through a nut in the centre of a small worm-wheel, retained in a fixed collar bearing, and actuated by a worm on the spindle, Y, which last is provided with a hand-wheel, Z. The same spindle, Y, has formed upon it another worm, *a*, gearing into a small worm-wheel, *b*, which is formed with a central eye, for the passage through it of the tubular rod, S. The worm-wheel turns this rod, so as to screw the top rod, R, in or out, by means of a groove and feather, thus not impeding its vertical movements. By turning the hand-wheel, Z, the spindle, U, and spanner, T, are raised or lowered, and at the same time the rod, R S, is elongated or shortened in an equal degree, so as always to maintain the same position relative to the spanner, T, and in order that this last may have the same action upon the valve lever in whatever position it may be vertically. When the steam valve is shut in the manner described, it is kept so until the descent of the hammer bar by means of a catch acting on a collar formed on the tubular piece, S. This catch is thrown out by the percussion of the hammer's blow, at whatever point the blow may take effect, according to the thickness of the work upon the anvil. The means by which this is effected consists of a bar, *c*, indicated by dotted lines in fig. 1, and jointed to upper and lower crank levers, *d*, vibrating on pins projecting from the framing. The other ends of the lever, *d*, are jointed to a vertical rod, *e*, passing down to a short lever fixed on the spindle, *f*, which carries the catch before referred to. The cross-head, J, of the hammer bar carries a small weighted kicker, which strikes against the bar, *c*, on the descent of the hammer bar, being caused to do so by the momentum of the fall and shock of the blow. This action depresses the rod, *e*, and putting the catch off the collar of the rod, S, allows the spring to raise the latter, and, at the same time, open the steam valve, so as to lift up the hammer for a fresh stroke. The valve lever, Q, has a handle formed upon it, in order that it may be worked by hand.

*A 35 cwt. hammer of this* kind, with a clear fall of 3 feet 6 inches, is now in operation at *the Ouseburn Engine Works.*

## THE VENTILATION OF METALLIC MINES.

BY HERBERT MACKWORTH, ESQ.

(*Continued from page* 200.)

It would hardly be possible to find a mine in this county which will not illustrate my assertion. The numerous shafts by which a large ventilation might enter, communicate indiscriminately and at all depths, so that the columns of air in them counteract one another. Two upcast shafts sometimes draw from the same downcast shafts. The air goes down a winze when it ought to be made to go up, or is allowed to pass through the deads, and other parts of the mine, thus becoming rarefied and impure before it has descended to the lowest point of the mine where the men are at work.

At the United Mines I found the singular instance of the upcast air ascending the pumping-pit, against a heavy leakage of water. It was alone enabled to rise by the high temperature which it had acquired in the mine.

Ventilation of mines is classed under the two heads of natural and artificial.

The science of natural ventilation consists in so arranging the currents of air in a mine that the cold air from the surface, by its density and dryness, shall descend at once to the lowest depths of the mine, and passing along the workings without leakage, shall supply the workmen with an adequate quantity, and absorb the heat (from the mine, the men, and the lights), the gases, moisture, and exhalations, so that they shall unite in rarefying the air during its ascent to the lowest part of the upcast-shaft to which it can conveniently be conducted.

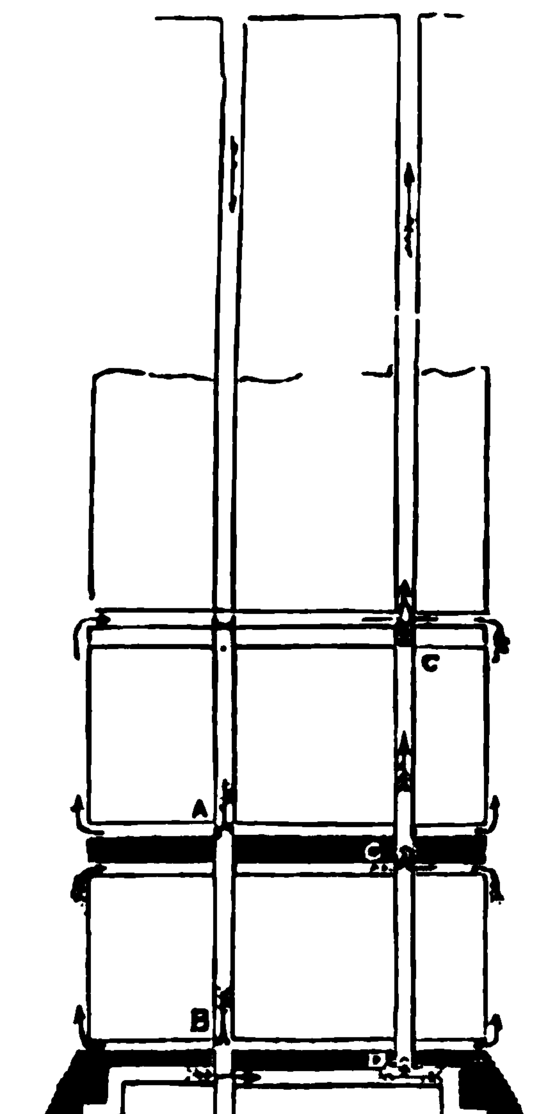
I have not met with one mine out of several hundreds that I have visited which had two shafts, or even one shaft divided by an air-tight brattice, in which during the winter time the current of air could not be increased to the quantity I have named, mainly by passing the air through *several* levels, from shaft to shaft, but at the same time carefully separating the air-passages. During that part of the year when the temperature of the atmosphere is too high to supply a sufficient power, a careful investigation of the gain and the cost will strongly recommend the adoption of artificial ventilating power.

A Cornish mine, in consequence of its numerous shafts, and the proximity of the workings to them, is much more readily ventilated than a coal mine. In the latter, before the time of Mr. Buddle, who introduced the great improvement of having several currents of air between the shafts in lieu of one (technically, "splitting the air"), the air sometimes travelled a length of seventy miles underground before returning to the surface, and even now it frequently traverses from five to ten miles.

The Hetton Colliery has four downcast shafts and one upcast. There are thirty-five currents of air between them, and with natural ventilation alone (that is, with a temperature in the downcast shaft of 54°, in the upcast of 73°), the quantity of air passed through the colliery amounted to 118,000 cubic feet of air per minute. The average length of each air-current is two miles and three quarters. The largest amount of air obtained in this colliery by two furnaces, each 8 feet wide, and a third 9 feet in width, employed in rarefying the air, amounted to 225,176 cubic feet per minute.

Some coal mines in this country, from the vertical position of the seams, are worked in a similar manner to the Cornish lodes. Of one of these I give a transverse section. It is ventilated by the amount of air before

Fig. 1.




mentioned, as requisite throughout the year, by means of a small jet of water in the top of the pumping-pit, which is also the downcast shaft. The air reaches the two veins of coal, which are worked by means of the cross-cut, A, part descending to a lower cross-cut, B. On reaching each

seam, the air is split both ways, passing about 120 yards along the levels, and then sweeping up the faces of work, returns along the higher levels, and re-uniting, passes through other cross-cuts, C D, to the upcast shaft. The air in the workings forms eight distinct currents, perfectly separated one from the other.

It is not necessary to multiply examples to prove the great similarity which exists in the conditions of metallic mines and coal mines, and the perfect applicability to the former of those principles of ventilation which have reached so high a degree of perfection in the latter.

In the deepest coal mine in England, that at Monkwearmouth, a singular effect is experienced, which would no doubt be equally the case in the still deeper mines of Cornwall if the ventilation were improved. The asthmatic colliers in the neighbourhood endeavour to get work at that pit, as the additional dose of oxygen which they obtain from the denser air removes temporarily the pressure of their complaint, although it returns if the pit stops for several days.

To explain the cause of what I have termed natural ventilation, let us suppose that in a room with two chimneys the air were made to descend one chimney and consequently to ascend the other; the warm air of the room having once filled the second chimney, there is a column of air in it more rarefied, consequently lighter than in the first or downcast chimney. If we assume that thirteen cubic feet of air weigh 1 lb., and that air expands or contracts 1-519th part of its bulk at 60° for every degree of increase or decrease in its temperature, the actual weight of the air in each chimney or shaft can be exactly estimated. One column of air will balance the other like weights over a pulley, and the lightest will ascend with a velocity which obeys the same mechanical laws as the pulley, and can be equally calculated.

The phenomena in a mine, whether acting in two shafts or two winzes, are precisely similar. The air ascends the higher of two shafts, because the longer the column of rarefied air, the greater is the difference of the weight resting on the bottom of the shaft, and the greater the force which causes ventilation. Air usually ascends the smaller of two shafts of equal depth, because it has a larger heating-surface of rock in proportion to its area, or in proportion to the quantity of air contained in it, and it consequently heats the air more highly.

When the ventilation in a mine is once started it tends to keep in the same direction, from the gradual assimilation of the temperature of the surfaces, especially if of wood or brick, to that of the passing air; but in summer, when the heat of the atmosphere is much greater than that of the walls of the mine, the ventilation (after a period of stagnation more or less long) gradually reverses, descending the smallest or highest shaft, according to the principles already explained. In one instance it even carried into a mine the smoke of a badly-constructed furnace, intended for its rarefaction.

In a general sense it is most correct to say, that the force of ventilation depends on the difference in weight of two columns of air, reaching from the limits of the atmosphere down to the bottoms of two shafts, when they are on the same level. These columns can be compared by a delicate barometer. When one shaft is deeper than the other, allowance must be made for the difference between the weight of the air in it, and of the weight of the air ascending or descending through the workings.

In the Standedge Canal tunnel, 5,720 yards in length, which passed through the range of hills forming the back-bone of England, the shafts were closed, but still the air travelled through with a velocity of eight or ten lineal feet in a second, and sometimes in opposition to the wind. Finding that the sun shone frequently on one side of the hill, whilst it rained on the other, I was led to the conclusion, that this arose from a slight difference in the pressure of the atmosphere at the entrances of the tunnel, aided by the air from the tunnel having become saturated with moisture. The vapour of water in the air of a mine has a material effect on ventilation; in the upcast shaft, especially when the air is rarefied by a furnace, it adds to the power. In warm damp weather the ventilation is checked by the abundance of vapour in the downcast air. In the heat of summer a dry downcast shaft will sometimes become covered with moisture, the walls of the shaft, by their greater coolness, precipitating the moisture contained in the air.

It is generally desirable to let the air descend the pumping-shaft, as the falling water in summer cools the air as it descends. If it should unavoidably happen to be the upcast, the pumps should be bratticed off, as otherwise the water and the metal-surfaces would rapidly destroy the rarefaction of the ascending air. Water running down the sides of an upcast shaft is very prejudicial, and those shafts are most favourable to ventilation which are walled with brick or stone.

In no country has the economy of power been carried further than in Cornwall, yet in the ventilation of the largest mines the greater part of a natural ventilating force is sacrificed, equivalent to nearly fifteen-horse

power. The loss of this force is almost wholly due to the want of a perfect air-tight separation between one down-cast shaft and another, and between all the air-currents from the point where they separate to the point where they reunite, by means of close stoppings of rubbish, walls, boarding, or doors, sufficient to prevent the smallest leakage. There may be several downcast shafts to one upcast, but never the contrary. If these rules are departed from the ventilation is always tending to reverse in whole or in part, and the shafts (to speak technically) "fight."

The air should not be taken up one winze and afterwards down another, as then the air in the downcast winze, being warmer and moister, consequently lighter than in the upcast, a double amount of that ventilating power is sacrificed which should be hoarded as the most valuable accompaniment of a deep mine. The upcast shafts should have as few obstructions as possible, and for this purpose the usual winding-shafts may be advantageously employed. The quantity of air which a winding-shaft, 200 fathoms in depth, will ordinarily pass in cold weather, with a well-arranged under-ground ventilation, may be assumed at about 500 cubic feet of air per minute for each square foot of its area. This quantity of air will be increased or decreased in proportion to the square root of the depth of the shaft. The higher natural temperature of the rock at greater depths, especially in some of the Cornish mines, will afford a still larger result. The mean temperature of Cornish mines, as given by Mr. Henwood, is generally higher than that of coal mines, and at a depth of 250 fathoms there is a difference of upwards of 10°. The temperature of 105° in the United Mines is greater than the artificial heat imparted by a furnace, by which many coal mines are ventilated. Metal air-trunks or brattices are objectionable, on account of the rapid cooling of the surface. Brattices in shafts tend to equalize the temperatures of the currents of air flowing up and down on the opposite sides, and there is in general a great loss of power as well as air, from leaks. A crack one-eighth of an inch wide on each side of a brattice 100 fathoms deep will amount to an area of 12 square feet, and cut off most of the ventilation.

It is of little use to carry up a deep shaft into a stack or tower at the top, for as the ventilation increases as the square root of the depth of the heated column of air, a stack 60 feet high on a shaft 100 fathoms deep will only increase the quantity of air by one-twentieth. A wall or boarding round the top is useful to free the shaft from the effect of the uncertain currents of wind which sweep along the surface of the ground.

The air-ways of a mine present a resistance to the passage of air, proportioned to their length and size. The quantities of air passing along the different horizontal air-ways of a mine vary inversely as the square root of the length of each air-way, when the air-ways are long, in proportion to the depth of the shafts. It follows that if an air-way of 4,900 yards in length can be replaced by two air-ways, between shaft and shaft, of 2,500 yards in length each, the quantities of air passing will be as 50 in the first air-way, and 70 in each of the second; the quantity of air will, consequently, be nearly trebled by this division, or splitting. If three splits of air, each 1,600 yards in length, can be substituted for the first air-current, the quantity of air will be five times as great. In the Hetton Colliery, before alluded to, the large quantity of air is due to the thirty-five splits, which diverge as soon as possible after quitting the downcast shaft, and unite near the bottom of the upcast. In like manner, in Cornish mines, each range of levels may have a separate current of air. When the downcast shaft is in one lode, and the upcast in another, and the air has to pass through one or more cross-cuts, they should be driven as large as possible, as the uniting of the various currents, in traversing them, occasions a loss of power, from the reasons before stated, as well as from the increased velocity of the current of air passing through the contracted space.

The resistance to air increases as the square of its velocity. The quantities of air passing through air-ways of equal length, vary nearly as the area multiplied by the square root of the diameter of the air-way. Thus, if there be three air-ways, of 4, 5, and 6 feet square, the quantities of air will be as $16 \sqrt{4}$, $25 \sqrt{5}$, $36 \sqrt{6}$, or 32, 55, and 88 respectively. It is therefore important to have all the air-ways of the same uniform size, and no partial contractions, which can possibly be avoided.

The quantity of air which will pass through any given mine may be approximatively determined by the formula,—

$$V = \frac{200}{L} \sqrt{h (t - t_1) C}.$$

Where $h$ is the depth of the shafts, $t_1$ the temperature of the downcast shaft, $t$ of the upcast, L is the length of the longest air-way, and C the cubical contents of the whole of the air-ways.

Air in motion always takes the shortest course, and if there were several currents passing from shaft to shaft through separate levels, the most air would pass along the

highest or the shortest level, unless this were partially closed by a regulator. A regulator is commonly a shutter of wood, sliding in a groove. Amongst the advantages of splitting air, this must be enumerated, that if at any time more air is wanted in one split, it can be obtained by partially closing the others.

The first thing to be done in improving the ventilation of any mine is to make the stoppings or divisions between air-currents air tight. I have known many instances in which this course has enabled workings, abandoned from the poorness of the air, to be recommenced, as most of the air is commonly lost by leakage before it reaches the working-faces. The stoppings are usually built in dry walling, masonry, brick-work, or deals; in every case backed by several yards of rubbish, and often plastered on the face. The nearer to the shaft, the more carefully closed they must be, as there is the greatest pull on the air and liability to leakage. The lodes in metallic mines being frequently robbed back even into the principal shafts, so as to destroy its sides, regardless of the subsequent expense in repairs and timbering, occasions sometimes almost complete loss of the current of air,—a state of things only to be partially remedied by the most careful timbering and stopping round the sides of the shaft. In consequence of the increased leakage at high velocities, the air should not usually travel at a linear velocity of more than five feet per second, although in coal-mines a velocity of ten and even twenty feet is sometimes attained in the air-ways. Doors are used to direct and shut off the currents of air, and when used near the shafts two doors should be erected a short distance apart so as to prevent leakage, or the cutting off of the ventilation of the mine by any person passing through a door. Whenever the doors are single, they should be so hung as to fall to of themselves, either opening at the side or in the middle. When a ventilation is well arranged, with deep shafts and large air-ways, the quantity of air will be so large that a separate split can be taken into each working-place, and very few doors, if any, will be required.

As the deep exploring-levels are driven forward, the intake air should descend to and proceed by the deepest level, and, passing up the last winze, return by the next level above. Beyond the winze, the air will have to follow the driving of the level, so as to clear out the powder-smoke immediately that a blasting shot has been fired. The means usually adopted to do this, and to carry the air into a blind end, are either a soller or planking, closed with clay, a foot above the floor, or an air-pipe or trunk, but the latter are generally too small for the purpose; they are shown in figs. 2 and 3. It will often be more convenient to use thin

Fig. 2.

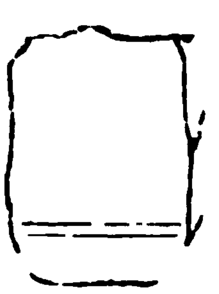


Fig. 3.

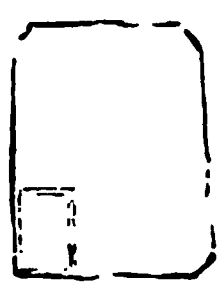


Fig. 4.

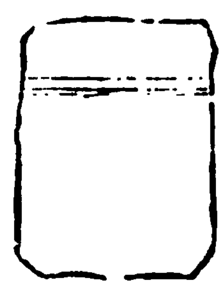


Fig. 5.

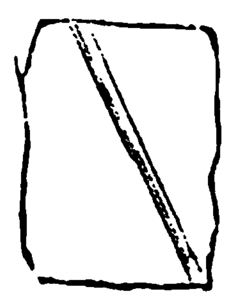


Fig. 6.

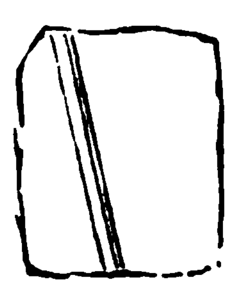


Fig. 7.

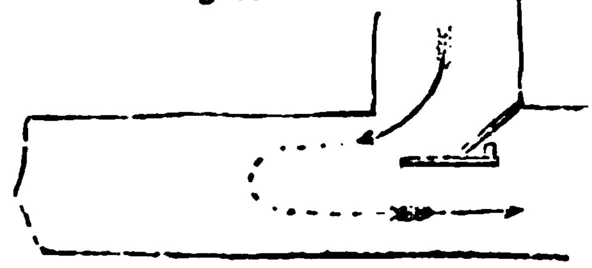
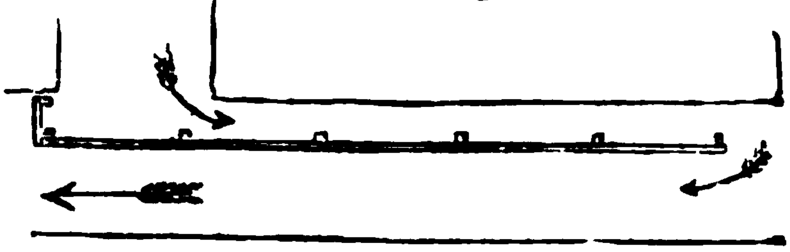


Fig. 8.

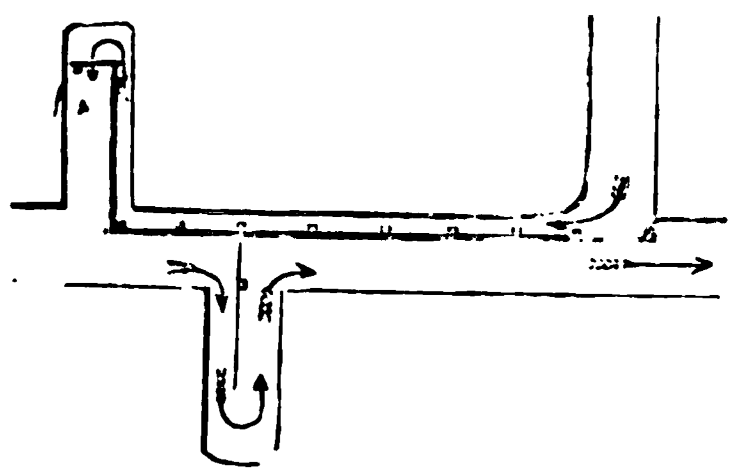


wooden or canvas brattices, either horizontal under the back of the level, or leaning to or from the wall, as usual in coal-mining, and figured in the engraving as 4, 5, and 6. By this means a large area for the passage of air can be obtained. The canvas is tarred, and the wooden brattices are made of half-inch deals, in frames of six feet square, or any other convenient size, and spiked or tied to the posts and bearers, the joints being stopped with hay. Air may often be directed effectually into an end, for a short distance, by shething, which generally consists in setting a short moveable brattice in such a position as to direct the current of air in the right direction; it is shown in fig. 7. Fig. 8 represents a brattice such as has been described; and fig. 9 the method of airing winzes, in the course of rising and sinking.

The temperature in the ends should never be greater than the average heat of the mine; there should be a perceptible motion in the air in every part accessible to the miners, sufficient to dilute and carry off the injurious exhalations which necessarily

arise, as well as the noxious gases which escape from the decomposition in the deads into the air-ways which surround them. These impurities are rarely perceptible to the senses; but that spontaneous chemical action proceeds to a great extent in the abandoned workings, we may perceive by the salts and acids taken up by the water, the incrustations on the surface of the rock, and the growth of fungi. It may be necessary, in some cases, to carry a current of air over the edges of the deads, or past the

Fig. 9.



openings into old workings, for the sole object of preventing the penetration of these poisons into the working places. Every air-way should be travelled by appointed persons once a week, and they should be so arranged, if possible, that the current of air should not be cut off from other working parts by the swamping of a level.

The large section of a Cornish mine shows the application of the principles which have been described, and the mode in which a mine may be divided, so as to have two upcast shafts. I trust that an examination of this section* will show how simple are the arrangements by which the whole of the ventilating power may be economized which is everywhere existent and ready to our hands. It is a power that, the deeper we penetrate the bowels of the earth, and the more removed we are from the pure air of heaven, exists, by the bounty of Providence, in a higher degree. It is subject to the same laws as those by which our atmosphere itself is changed and mingled in due proportion, and death-bearing miasmata are diluted or destroyed; by which the phenomena of cloud and sunshine, rain and dew, summer and winter, are directed under an allwise and beneficent Power to supply our wants, and enable us to choose those conditions most favourable to our frames and our requirements. An accurate study of the bounds which He has set enables us to modify any of these conditions to our special uses; and we are surely wanton in our neglect if we allow, year after year, the health and lives to be sacrificed of the most laborious and enterprising part of our fellow countrymen.

(*To be continued.*)

* We regret that the plate is not capable of being reduced to the limits of our pages.—Ed. M. M.

## PHOTOGRAPHIC MANIPULATION.

### LE GRAY'S WAXED PAPER PROCESS.*

The treatises mentioned below, published by Messrs. G. Knight and Sons, photographic apparatus manufacturers, Foster-lane, Cheapside, are important contributions to the art of photography, and should be in the hands of every professional and amateur manipulator. In his essay, Mr. Hennah has very prudently preferred to confine himself to the thorough development of an efficient method of taking pictures by the collodion photographic process, rather than to attempt a "pointless summary" of all that has been written concerning it. His plans have the merit of being the well-considered results of long personal experience.

The waxed paper process of Mr. Gustave Le Gray having become very generally esteemed, it was highly desirable that it should be rendered into English, and published in an accessible form. The Messrs. Knight have, therefore, been fortunate in issuing the present cheap translation of it, of which photographers will doubtless universally avail themselves.

As the subject has become one of very general interest, and as we believe Le Gray's to be superior to the collodion and other processes for some purposes, we will take this occasion of laying it, as briefly as possible, before our readers, following Le Gray's own statement of it, as rendered in the Messrs. Knights' translation.

The limits of our space are, however, such that we must restrict ourselves to the simple details of the process, referring to the pamphlet itself those who require a statement of the advantages of the process, a description of a method of fixing the negative by the bromide of potassium, a method of preparing albumenized positive paper, and iodized waxed paper for portraits, etc., etc.

*Preliminary Preparation of the Negative Paper, or Waxing Process.*—The object obtained by this process is the filling up completely all the pores of the paper, by the introduction of wax.

The paper, when thus prepared, assumes

* "The Waxed Paper Process of Gustave Le Gray. Translated from the French." "The Collodion Process. By T. H. Hennah. Second Edition. London. 1854."

the appearance and strength of parchment; and after the development of the image, it does not require to be again waxed to obtain a positive picture.

Take a large daguerreotype plate, or similar piece of plated metal, and place it horizontally on a stand. Warm it by passing a spirit-lamp under it, or it may be heated more equally by a water-bath; pass then over its surface a piece of white wax; when a good layer of melted wax has thus been obtained, place a sheet of paper on it, and facilitate the adhesion by means of a card. When the paper appears completely saturated, remove and place it between sheets of bibulous or blotting-paper, over which pass a moderately hot iron, in order to absorb any excess of wax; as it is essential that the wax should be equally spread through the body of the paper, and that none should remain on the surface. A sheet of well-prepared paper, when held up to the light, should not show any shining spots or patches on its surface, but be uniformly transparent. Care should be taken that the iron is not too hot. Thin paper is preferable for this process.

FIRST OPERATION.—*Preparation of the Negative Paper.*—Boil 7 oz. of rice with 320 grains of isinglass in 6 pints of distilled water, in a porcelain or glass vessel; the grains of rice should only be slightly broken, so that the liquid obtained is not rendered sticky by an excess of starch, but contains only the glutinous portion of the rice; the whole is then to be strained through a piece of fine linen.

To prepare the first bath, in which the wax paper is to be immersed, dissolve in 2 pints of the rice-water the following:

| | | | |
|---|---|---|---|
| 1½ | ounces | sugar of milk. | |
| ¼ | „ | iodide potassium. | |
| 12 | grains | cyanuret | do. |
| 7½ | „ | fluoride | do. |

When all are dissolved, filter the solution through fine linen, and preserve the clear liquid in a bottle for use.

This preparation will keep perfectly good for a long time, and may be used to the last drop; in cold weather, it is better to slightly warm the solution before using it. To prepare the paper, pour into one of the photographic dishes a quantity of the solution, to the depth of 1 inch or more; plunge into this sheet after sheet of the waxed paper, taking care to remove all air-bubbles that may form; fifteen to twenty sheets may be thus immersed, and they may be left in from half an hour to an hour, according to the thickness of the paper employed. Now turn the whole mass; and commencing with the first sheet that was put in, take them out one by one, suspending them to a line by means of a bent pin attached to one of the corners, and allow them to dry. A roll of blotting-paper applied to the angle where the drops fall will facilitate the drying.

English and French papers should not be prepared in the same solution.

The paper being dry, is to be cut to the size required, and kept in a portfolio for use.

The paper thus prepared should have a slight tint of violet; this tint is very easily obtained with an old solution, as such solution possesses an acidity which sets the iodine free.

The same result is to be obtained with a solution freshly prepared, by adding to it a small portion of pure iodine, three or four grains to the quart.

This paper being nearly insensible to light, it can be prepared in the day; however, too long an exposure to a strong light will decompose the iodide of potassium, and precipitate the iodine upon the starch of the paper. It is, therefore, much better not to expose it to a strong light.

This paper will serve either for landscape or portraits; it gives good modulations of tone, and intense blacks.

The liquid which remains after having taken out the paper, should be corked up in a bottle; it may be used to the last drop, but should be filtered previously.

There may be added, with advantage to this solution, two whites of eggs beaten up to each quart.

SECOND OPERATION.—*Method of Rendering the Iodised Waxed Paper Sensitive, and fit for Use in the Camera.*—Prepare in the dark, or by the light of a single candle, the following solution in a bottle, with a ground stopper:

| | |
|---|---|
| Distilled water .... | 10 ounces. |
| Nitrate silver ...... | 320 grains. |
| Acetic acid ........ | ¾ ounces. |
| Animal charcoal .. | ¼ „ |

When the nitrate of silver is dissolved, add the acetic acid, after which the animal charcoal.

The bottle is to be well shaken, and the solution then left to settle; the clear liquid may in about half an hour be poured off and filtered, when it is ready for use.

The animal charcoal remaining in the bottle is to be preserved, to decolourize the aceto-nitrate, should it become discoloured by the iodized paper in a subsequent operation. Care must be taken that all crystals formed at the bottom of the bottle be redissolved.

The above quantity of solution is calculated to render sensitive twenty sheets of paper, 10 in. by 14 in.; if a larger number be used, the sensitiveness will be lessened.

Two flat porcelain dishes are now to be perfectly cleaned; * into one is put a sufficient quantity of the aceto-nitrate of silver to cover the bottom to the depth of four-tenths of an inch, into the other distilled water. Upon the first dish, viz., the aceto-nitrate, is placed a sheet of the iodized waxed paper; the upper surface of the paper being pressed (by means of a suitable brush), so as to bring it into contact with the liquid, removing all air bubbles that may form on the under side. It is left in this bath four to five minutes; should the iodized paper be tinged with violet, it may be removed as soon as it changes to white, as it will then have received its maximum of sensibility.

The paper being removed from the nitrate of silver, is placed in the second dish, viz., that containing the distilled water; care being taken to remove all air-bubbles with another brush, which must be kept distinct.

Ten sheets may be prepared in the nitrate of silver dish without refiltering the solution, and may be placed one over the other in the distilled water. The sheets are then to be removed by means of the brush or brushes into a second basin, and fresh distilled water poured upon them; should the paper have to be kept for any length of time, it should receive an extra washing.

It is desirable to preserve these separate waters for uses we shall presently explain.

Take out the paper sheet by sheet, dry it between some perfectly clean thick blotting paper, afterwards preserve it in another case of blotting paper ready for use.

This paper should not be dried by suspending it, being liable to spoil by so doing when in the gallic acid; it is better placed between blotting paper, putting alternately a sheet of prepared and a sheet of blotting paper.

By keeping the paper from the light, it will preserve its sensitiveness for a fortnight.

The dirty and smeary appearance which the waxed paper frequently assumes in the gallic acid, and even after the picture has been dried, is of no consequence, as this completely disappears, and the picture becomes perfectly transparent after the wax has been re-melted, by exposing the negative to a sufficient degree of heat; this process should always be adopted, being superior to re-waxing.

Ten sheets being finished, return the aceto-nitrate of silver into the bottle containing the animal charcoal, agitate all together, and leave it an instant to settle; then re-filter it, and prepare a further ten sheets (more or less) as may be wanted.

When the aceto-nitrate of silver has served to prepare the proper quantity of paper, and is consequently exhausted, the remainder may be made useful by pouring into it some chloride of sodium. A precipitate of chloride of silver is obtained, which serves to improve the hyposulphate of soda, enabling it to give finer tones to the pictures.

THIRD OPERATION.—*Exposing the Sensitive Paper in the Camera.*—Place the paper very smoothly in the dark slide, if a double one, with a piece of bibulous paper between the two, obtain a good and perfect image on the ground glass, focussing upon a middle object, one neither too near nor too distant. As to the time of exposure, experience only can determine it, though much of the beauty of the picture depends upon it.

For a portrait, and using a compound lens, I find thirty seconds to one minute in the shade generally sufficient, and from ten to thirty seconds in the sun. For views, and with a single lens, and a diaphragm of ½ in. to ⅝ diameter, from thirty seconds to twenty minutes in the sun, though much, of course, depends upon the object.

Heat, which is one great cause of acceleration, when operating by the wet process, has very little influence in this dry one. Thus, by warming the slate upon which the prepared wet paper is placed, you operate much quicker, but the lens must be warmed also; if not, it will be covered with vapour, which will prevent the formation of the image. When operating in the sun, this vapour will often form; in this case the lens must also be warmed, taking care to wipe it if necessary. This inconvenience is sometimes obviated by placing a white handkerchief over the camera when the sun strikes too forcibly on it; the rays will thus be reflected and not heat the camera.

The exposure in the camera being finished, the image is but slightly apparent, and is only developed by the following operation, which can be done at once, or left for one or two days, or even longer.

I have often developed the picture ten days or a fortnight after the exposure in the camera, and have obtained a very good result.

FOURTH OPERATION. — *Developing the Image.*—The solution of gallic acid will not keep; it must therefore only be made when required.

Weigh up several packets of gallic acid of 7½ grains, put into a flat dish from half a pint to a pint of the water used for washing the negative, and which consequently contains a small quantity of aceto-nitrate of silver; put one or two of the packets of gallic acid into it, stir the whole together, and then plunge the negative picture in, so that both sides be well covered.

* For this purpose the Papier Joseph will be found very convenient.

The development of the picture is readily seen even through the thickness of the paper; it may be left from ten minutes to one or two hours, and sometimes even longer, until it is fully developed. It is then to be taken out quickly, and put into another dish to wash it, rubbing it lightly on the back with the finger or brush, to remove the crystalline deposit, which might spoil it. The grey tint which the waxed picture takes, whilst remaining in the gallic acid, is of no consequence, as it totally disappears afterwards, and the lights and shades are beautifully developed.

The tone which the negative takes in the gallic acid will enable the operator to judge whether the time of exposure in the camera was sufficient. If it becomes immediately dark grey all over (examined, of course, by being held up to the light), it has been exposed too long in the camera.

If the strong lights, which should be the deep blacks, of the negative are not darker than the half tints, the exposure has still been too long. If, on the contrary, the time of exposure has been too short, the lights alone will be faintly marked in black, the picture will not be modified, but equal all over.

If it has been the proper length of time, a superb negative is obtained, which will present the contrasts of light and shade very distinctly.

A first proof will serve to regulate the time of exposure in the camera in future.

It wonderfully accelerates the operation of developing, if the gallic acid is warmed. A very simple apparatus may be used; it consists of a water-bath, which, by means of a spirit lamp, is kept at about 120 degrees of temperature; upon this rests the dish of gallic acid; an equal temperature is thus obtained.

The negative being fully developed to the satisfaction of the operator, it is removed into another bath of clean water.

If spots should form, produced by the oxide of silver, they may be removed by pouring over the negative some acetic acid, passing a brush lightly over it.

FIFTH OPERATION.—*Fixing the Negative.*—Make in a bottle the following solution:

| | |
|---|---|
| Filtered water . . . . | 24 oz. |
| Hyposulphite of soda . . | 3 oz. |

Put this in a dish to the depth of two-tenths of an inch, plunge the negative completely in, paying great attention to remove all air-bubbles.

The hyposulphite of soda removes all the salts sensitive to light, but has no effect on the gallate of silver, forming the dark part of the picture.

*Only one picture* should be placed at the same time in this bath, though the solution may be used for many in succession.

The hyposulphite may be preserved in a bottle, the clear portion being filtered for use, and will be found preferable for weak proofs.

On examining the proofs sometime after they have been in the bath of hyposulphite, the operator is tempted to think they are spoiled, because the iodide of silver, which has a pale yellow tint, being completely taken out in some places, and remaining in others, forms spots, destroying, to all appearance, the image; but by waiting till all the iodide of silver is completely removed, which is seen by the yellow tints disappearing, the whiteness and transparency of the picture, as well as the beauty of the shadows, are fully developed.

If the negative remain too long in the hyposulphite, it will lessen the intensity of the blacks; too much attention cannot be paid to this operation.

The picture must now be washed in several waters, then left in a large basin of water for about half an hour, in order to remove all trace of the hyposulphite of soda; it is then dried between blotting paper.

The proof thus fixed is unalterable by light, since there only remains in the paper the gallate of silver.

SIXTH OPERATION. — *Renovating the Transparency of the Waxed Negative.*—After the preceding operations the negative has frequently a streaky appearance.

To remove this, hold the negative to the fire, so as to re-melt the wax, which will restore its transparency. Another method is to hold the negative over some lighted sheets of blotting paper which have been already used for other purposes.

SEVENTH OPERATION.—*Preparation of the Positive Paper.*—Make a solution of

Hydrochlorate of ammonia, ¼ oz.
Distilled water, 5 oz.

Put two-tenths deep of this solution in a dish.

Make then another solution containing—

Nitrate of silver, ¾ oz.
Distilled water, 5 oz.

Put the same quantity of this into another dish.

The paper, which should be a little thicker than for the negative, is to be previously cut to a convenient size, observing which is the wrong side, and marking it with a cross; this is easily recognised, being the side which shows the impression of the metallic cloth used in its fabrication, the woof remaining imprinted upon it, and may be seen by viewing it by a bright light.

The best paper for this operation is that of Canson Freres.

Place the right side of the paper upon the first solution, not permitting the liquid to touch the other side; leave it there from two to four minutes, then take it out and dry it between several sheets of blotting paper, rubbing it with the hand.

Prepare three sheets of paper thus, taking care that every trace of humidity be removed.

Take the first sheet, and with a large brush rub the prepared side, for the purpose of cleansing it from all impurities.

Place it then upon the solution of nitrate of silver, taking care to wet only the salted side, and leave it whilst you cleanse another sheet.

By leaving the paper for a short time on the nitrate of silver, red tints are obtained; prolonging the operation, black tints are produced. The paper is then dried by suspending it by one corner. This operation should be performed in the dark, or by the light of a single candle.

Be careful that the positive paper be perfectly dry before placing the negative upon it.

It is better to prepare this positive paper the evening before; but if used at the time of preparation, dry it well by the aid of a spirit-lamp, or before a fire.

If a great number of positive pictures are required, the operation can be accelerated by submitting the paper to the first bath, and leaving it to dry, as before described. This operation can be done at any time; the paper will keep an indefinite period, before receiving the bath of nitrate of silver.

In this case, only put 60 grains of hydrochlorate of ammonia to 3 oz. of water for the first bath. The second, containing the nitrate of silver, remains the same, and is prepared only a few hours before required for use.

Eighth Operation.—*Printing the Positive.*—Take the negative and place it upon the glass of the copying frame face upwards; lay over it a sheet of prepared positive paper; the sensitive side of the paper being placed in contact with the right side of the negative; over them place the second glass, if two be employed, and then the back of the frame, which is then pressed down by means of the tightening screws. A sheet of transparent waxed or gelatine paper may be placed between the negative proof and the positive paper. This will preserve the negative from any contact with the nitrate of silver, which might spoil it. A small piece of the positive paper may be allowed to project from the frame, for the purpose of judging, by the change of colour, of the progress of the picture without disturbing it.

Expose the frame to the sun, so that its rays may fall perpendicularly on the proof.

The various successive tints that the proof will take are as follows:—Greyish blue, neutral tint, blue, violet, dark blue, bistre, coloured sepia, yellowish sepia, dead-leaf yellow, grey—all diminishing gradually till the oxide of silver is reduced to its metallic state.

It is impossible to fix the precise time for the exposure to the light; it must be regulated according to the vigour of the negative, and the intensity of the positive required. For example:—To obtain a proof of a black tint, the dark parts should have a sepia tone, and the lights a greyish blue. The operator may, therefore, watch the progress of his picture by the projecting piece of paper, and remove it at the tint he requires.

Ninth, and Last Operation.—*Fixing the Positive.*—The positive thus obtained is not permanent; it must be fixed promptly by the following operation:

Make a solution of

Hyposulphite of soda, 3 oz.
Filtered water, 18 oz.

Then dissolve 277 grains of nitrate of silver in a glass or two of water; when it is dissolved, add a solution of chloride of sodium, till the former loses its white appearance. Leave the whole to settle for a minute, then decant the liquid; a precipitate should remain of 231 grains of chloride of silver. Expose this precipitate, in a small capsule, to the sun, to blacken it, taking care to stir it about with a glass rod, so that all portions be affected, and expose it to the solar rays. When it is quite black, put it in the first mixture, namely, the hyposulphite of soda, and leave it to dissolve. By this preparation, the black tints are immediately obtained with the fresh hyposulphite.

The hyposulphite being better when it is old, should it become thick, add a fresh solution, leaving out the chloride of silver; the old containing an excess, which it has imbibed whilst remaining on the proofs.

Care should be taken to filter the solution, to collect the black deposit which forms. This last may be dissolved in fresh hyposulphite.

By leaving the picture in this bath, for a shorter or a longer period, all the tints may be obtained, from the red to the black, and even to the clear yellow. A little experience will soon enable the operator to obtain the required tint. To fix the proof properly, it should never be left less than an hour in this bath; and even three or four days will be necessary to obtain the sepia and yellow tones.

The operation may be accelerated by

warming the hyposulphite. The picture, however, must never be left for an instant to itself, the rapidity of the action being very great. This method should only be employed when pressed for time, the results being generally not so good.

By adding to the preceding solution of hyposulphite three-quarters of an ounce of ammonia, very pretty bistre tints are obtained, and very pure whites.

Good yellow tones may be produced by putting a strong proof—first, into the bath of hyposulphite, well washing it, and then placing it in a bath, composed of 2 pints of water and 1½ ounce of muriatic acid, washing it well afterwards in water.

Liquid ammonia employed in the same proportions, without previously putting the proof in the hyposulphite, will also produce excellent tones.

When the desired tones are produced, wash the picture in several waters, and leave it in a water bath for several days, so as to extract all the hyposulphite of silver. This can be ascertained by touching the picture with the tongue; if there be any remains of the hyposulphite, there will be a sweet taste.

The proof is then to be hung up by one corner, and afterwards dried between blotting paper. The whole operation is then finished.

Printing the positive requires all the attention of a skilful artist, and should not be regarded as a secondary matter.

It is necessary to observe with attention the shade of the picture with the subject, and the effect to be produced.

I should add, that if a first-rate picture is required, it is better to put it alone in the bath of hyposulphite of soda.

## ON MECHANICS' INSTITUTIONS.

A very excellent and important lecture on Mechanics' Institutions was recently delivered by Mr. R. Hunt, F.R.S., at the Educational Exhibition of the Society of Arts. As the subject is one to which we propose calling the serious attention of our readers in a future Number, we shall do no more at present than present to them a summary of Mr. Hunt's remarks.

After dealing with the history of the rise and progress of Mechanics' Institutions, he proceeded to examine the causes which had led to their decline. He stated as the result of his experience, that there were but few institutions in the country which could be regarded as pecuniarily successful. Nearly all of them were complaining that their funds were insufficient to carry out their designs, *and that they were compelled to have recourse* to amusements of an attractive character, to secure the number of members necessary to keep the Institution on its legs.

The lecturer then advocated, in the most earnest manner, the necessity of providing rational entertainments for the people, but he insisted upon the incompatibility of entertainment and instruction in the same arena.

To the mistaken attempts which had been made to convert the lecture-room into a concert-room, the lecturer attributed the failure of the popular institutions. He contended that institutions organised for the instruction of the people, should not devote themselves to their amusement, and if the doors of Mechanics' Institutions could not be kept open without the various kinds of entertainments now indulged in, one of two courses were open—shut the doors, or call things by their right names; turn literature and science out of doors, and boldly proclaim the institutions to be for the entertainment of the people.

He then remarked on the peculiar aptitude which was necessary to the correct delivery of a popular lecture on science, and quoted two examples of failure—in one case from too exalted a tone, and in the other from too low and imperfect a demonstration. That Mechanics' Institutions might be made to pay, the lecturer believed, provided they returned to their legitimate ground. He adduced the remarkable attendances on the courses of lectures on science at the Government School of Mines in proof of this.

A return to a system of instruction by detailed courses of lectures was advocated, and the inutility, the mischief, indeed, of single lectures, pointed out. In addition to this, Mr. Hunt, dwelling on the advantages of cultivating habits of observation, proceeded to the main subject of his lecture,—the organization of classes of observation in all our local popular institutions.

He then proceeded to say:

If men will return to the condition of the child, and seek to know the things by which they are surrounded, they may of themselves acquire correct habits of thought. They will then appreciate the lectures which may be delivered in their institutions, and be enabled to discover the true from the false, whenever these are presented.

Taking the country museums, or the museums in large towns, as a nucleus, where they exist, I propose that every institution should add to its stores examples illustrative of the locality, and of it alone. Much money is spent foolishly in endeavours to form museums of curiosities — Indian arrows, grass hats, strings of shells, and New Zealanders' heads. These, from their necessary

incompleteness, have little to interest, and still less to instruct. Let the money spent in this way be employed in obtaining specimens of the Fauna and of the Flora of a well-defined district, collecting examples of its earthy and metalliferous minerals, its geology, and any other objects of local interest which may present themselves. He would propose that this should be effected by the organization of classes of observation in all the existing institutions. The task of these classes should comprehend the collecting of the natural history specimens common to the locality, and the careful registration of all particulars concerning them, such as the period of flowering of plants, the appearance of birds in the districts, and the commencement of their songs; the appearance of fish on the coast, and the thousand points of interest which cannot fail to present themselves to the careful observer.

Such classes will furnish subjects for every taste, and accordingly the members might volunteer their aid severally in that particular one from which they would derive the greatest pleasure. The following may be named as a few of the divisions—botany, zoology, conchology, entomology, mineralogy, geology.

Besides these, as sciences of observation, he would impress strongly the necessity of classes for meteorological observatious, statistical inquiry, and archæological research.

Each class should meet at stated periods, and every member then report progress. Specimens should be examined, and if possible named, and the recorded observations should be carefully compared. Every class should have its note-book, and it would soon be found that a mass of information of the utmost value would be obtained. There should be quarterly meetings of all the classes, at which reports should be read, uncertain points should be submitted to general discussion, and unknown specimens should be referred by the secretary of the Institution to some acknowledged authority, to be described and named.

From having seen the experiment tried, I can vouch for the enlarged pleasures which every member of such classes of observation will enjoy. Each morning or evening walk is resumed with increased pleasure; the flowers of the hedgerow or of the brook are watched with attention; and all nature assumes new and brighter features. The rocks, previously barren of interest, yield treasures; peculiar minerals are found, and strange shapes, telling the story of the progression of life on the earth, attract attention. All things appear to blossom with truths which had previously been passed unnoticed. There is no locality which has not some new facts to tell; and in collecting these each institution will provide the best exercise for the minds of its members, and add something of value to the common store of knowledge. Annual conferences should be held in connection with the Society of Arts; at these, well digested reports should be made, and these should be afterwards printed and circulated to every institution in the United Kingdom.

To listen to a lecture from a man of ability is good; to read with attention is good; but to observe is infinitely better than either. This system most intimately connects itself with class lectures; the man of science might direct the inquiries of the members of the institutions, and he would himself derive valuable assistance from their labours.

He had advocated such a system as this before, and he should continue to advocate it. The popular institutions of England are now wasting their powers; and, having no restorative element within themselves, they necessarily must decline. If we can organize a system of *work* for all,—a great industrial scheme,—rely upon it good must result. Let us try the experiment:

"Let us, then, be up and doing,
With a heart for any fate—
Still achieving, still pursuing,
Learn to labour and to wait."

## DICKER'S MAIL-BAG TRANSFERRING-APPARATUS.

In our Magazine for March, 1850 (No. 1390), we published an illustrated description of Mr. Dicker's improved apparatus for transferring mail-bags to and from railway carriages, at full speed, without checking or stopping the train. Since that time, the apparatus has been in constant operation in several of the principal lines of railway in the United Kingdom, with uniform and unvarying success. The Lords of the Treasury, upon a recommendation from the Right Honourable Viscount Canning, Her Majesty's Postmaster-general, have at length awarded to Mr. Dicker, who has held the office of Inspector of Mails upwards of fourteen years, the sum of £500, which has been paid to him as a compensation for his invention (to which he had fortunately secured a *legal right* by *registration*), and for his personal exertions in the successful application of his improvements for the benefit of the public service. A very beautiful working model of his mail-bag transferring-apparatus was shown, in operation, by Mr. Dicker, in the Exhibition of 1851 (class v.), and greatly admired by Her Majesty the Queen, as well as by numberless visitors to that building.

## SUGGESTION FOR REDUCING THE SHOCK IN RAILWAY COLLISIONS.

*To the Editor of the Mechanics' Magazine.*

SIR,—The greatest part of the mischief which is done in cases of collision on railways seems to be caused by the overturning and piling up of the carriages. If the blow which stops each carriage is not delivered exactly in the centre of gravity,—and it certainly will not be,—there will be a tendency to motion about that centre, either laterally or vertically, and the force being enormously great, either the carriages will turn over on their sides, or will break the coupling chains and be piled up endwise, just as would happen with the links of a chain in motion which should suddenly meet with an obstacle in front; but it will be seen that if the motion of the same chain were destroyed by stopping the last link instead of the first, there would be no such lateral or vertical forces. So also, if the opposing force could be made to strike the last carriage in a train instead of the first, and the coupling-chains were sufficiently strong, the passengers would be thrown forwards violently, but the carriages would remain on the rail, and no injury to the passengers more serious than a severe contusion would be possible.

This I think could be easily effected by having a bar of iron as long as the carriage hung under each of them, capable of sliding freely in the direction of motion. Have one corresponding thereto under the engine, and projecting in front of it as a common buffer, so that these rods may form a continuous shaft, and communicate the force from one end to the other without affecting the carriages. When the train is made up, fix a cross-bar to the axis of the last carriage, and let the end of the proposed bar butt against it. In the event of a collision the coupling chains may break, but the greatest part of the momentum would have been destroyed before the ordinary blow is given. If there is no great objection to having this bar projecting for several feet beyond the front of the engine, each of the rods in question might be furnished with a common spring-buffer end, so that the force would be received by as many springs as there are carriages in the train, instead of by the single engine buffer, as is now the case. Perhaps, Sir, some of your practical correspondents may see a means of carrying this notion into effect, or will otherwise be good enough to point out the difficulty in doing so.

I remain, Sir, yours, &c.,

N. B.

## CLEATS FOR THE RUNNING RIGGING OF BOATS.

*To the Editor of the Mechanics' Magazine.*

SIR,—Will you allow me to reply to a letter published in the Number of your Magazine for the 22nd July last, under the signature "J. M."?

The writer says that "a good deal of attention has lately been directed to the use of an eccentric-sheaved cleat for holding the sheets and other running rigging of sailing-boats. To show that this is not a new idea (though it appears that a Mr. Saxby has patented it), I beg to refer your readers to No. 1208 of your Magazine, for October 3, 1846, where a description will be found of *the eccentric cleat, and a drawing annexed.*"

Following this reference, I find an article, signed "J. M. G.," describing an improved "mode of fastening the sheets in yachts and boats." The drawing shows TWO eccentrics, with a rope between them, "one of them being of iron, *deeply grooved and roughened, so as to bite the rope;*" whereas mine is smooth as glass, and yet holds a greased rope with as much tenacity as a tarred one, and any material, from fine sewing-silk up to the heaviest and largest chain cable. Again, "J. M. G.'s" cleat is loosened by a slight jerk in a direction contrary to the strain.

I would ask your nautical readers whether a jerk would be an easy matter *when a sudden squall strikes a boat, and at the moment when the greatest drag of the sheet is on the cleat.* Suppose a second jerk be necessary, from the first being too feeble, where would the boat and crew be before it could be given? Then, again, "J. M. G.'s" requires "a spring" to be applied to render it perfect, by returning "the pulley" into a certain "position:" mine requires nothing, but is in itself complete. In one word, "J. M. G.'s" invention is complicated; mine is simplicity itself. "J. M. G.'s" is injurious to the ropes; by mine the ropes are not affected even with the greatest strain. "J. M. G.'s" would be impracticable when most wanted: mine is practically useful on any emergency, and with so much facility that the hand of a boy could govern it.

The very uncandid letter of "J. M.," suggesting that the eccentric-sheaved cleat, described in your Magazine, of October, 1846, is one and the same with my patent cleat, must be my apology for the strong and indignant language in which I repudiate, not only the identity but any similarity between the two. As to the simplicity of which I have made my boast, any of your readers may satisfy himself, upon application to Messrs. Redpath and Leigh, Lon-

don; Messrs. Henry Wood and Co., and Messrs. M'Andrew and Wood, Liverpool, manufacturers of articles for ships and boats, under my patent.

S. M. SAXBY.

Aug. 25, 1854.

## HIGHWAY BRAKES.

*To the Editor of the Mechanics' Magazine.*

SIR,—In Mr. Adams's paper on "Railway Brakes," at page 561 of your last volume, the writer observes that, "On the highway, the carriage stops to have the drag-shoe put on, and also to have it taken off." With but few exceptions, this is a correct representation of the case, but the exceptions prove that no necessity whatever exists for so unskilful and inconvenient a mode of procedure. The "Times," a four-horse stage coach, running daily between Exeter and Falmouth, has long been equipped with a drag-shoe, which is applied without stopping the coach, although it is necessary to do so before taking it off again. In this case the drag-shoe is affixed to the end of a lever, the upper end of which is jointed to the axle of the hind wheel, in front of which the drag-shoe is kept suspended, when not in use, by a chain, the handle being placed upon a hook on the right hand side of the coach-box. When about to descend a hill, the coachman releases the handle, when the chain permits the drag-shoe to descend and skid the wheel; on reaching the bottom of a hill, the horses are backed, and the drag-shoe again supported clear of the wheel by the suspending apparatus. Although this apparatus has been so long in use, it forms the subject of a very recent patent. Another and more complete arrangement, which has also been long in use, is applied to the country fire-engine of the West of England Insurance Company stationed in Exeter. In using this apparatus, the speed of the horses is not checked, either when putting on, or taking off the drag. In this arrangement the drag-shoe is attached to a lever, which is free to revolve on the hinder axle; a chain from the drag-shoe is attached to the body of the engine, in charge of a brakesman, who sits a little in advance of the near side hind wheel. When proceeding to a fire, this engine is drawn by four post-horses at their utmost speed; on commencing a descent, the brakesman allows the drag-shoe to pass under and skid the wheel, the first division of the chain being of the exact length for this purpose; on reaching the bottom of the hill, the brakesman releases a shackle, and the chain becomes lengthened sufficiently to allow the wheel to run off the drag shoe, which is then brought up over the wheel and suspended again in front of it, ready for another application. In this way the drag-shoe may be put on and taken off as often as required in the course of a journey, without the horses having been stopped, or their speed checked for that purpose.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

18, Angell-terrace, Islington, Jun 16, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

RIVES, JACQUES, of Hotel Motay, Rue Motay, Paris. *Improvements in railways and railway carriages.* Patent dated February 10, 1854. (No. 327.)

The inventor mounts each carriage wheel independently upon a tube, which slides on the axles, and proposes to render the passage round the curves easier and safer by arranging the axles in such manner that they may be set at any angle the one to the other by means of screws or other suitable instruments, which are acted on by an arm that comes in contact with guides fixed in the roadway corresponding with the curve at the commencement of which they are placed.

WARNER, HENRY, of Loughborough, manufacturer, and JOSEPH HAYWOOD and WILLIAM CROSS, of the same place, mechanists. *Improvements in knitting-machinery.* Patent dated February 10, 1854. (No. 328.)

*Claim.*—The combination of parts of knitting-machinery, whereby jack-sinkers are so constructed and worked as simply to form loops between alternate pairs of needles, lead sinkers (one to each needle) acting together with a moveable needle-bar dividing the loops (made by the jack-sinkers) between all the needles, and completing the course.

JOHNSON, JOSEPH, of Manchester, Lancaster, bootmaker. *Improvements in apparatus to be used for the preservation of life at sea.* Patent dated February 10, 1854. (No. 329.)

This apparatus consists of two bags or cases made buoyant by cork or other such material enveloped in horse-hair, and in the form of pillows. These bags are suspended from the shoulders of the wearer so that one rests across the chest and the other across the back.

MITCHELL, JAMES, of Dyke-head, Lanark, North Britain, gentleman. *Improvements in forcing and distributing liquids.* Patent dated February 10, 1854. (No. 331.)

This invention consists mainly in a mode of forcing or distributing liquids through pipes or channels by means of the pressure

of a fall of water, or other liquid acting (upon the liquid to be forced) in a closed chamber or vessel through the intervention of a moveable piston, shield, or diaphragm.

WHITELEY, WILLIAM, of Lockwood, near Huddersfied, York, cloth dresser. *Improvements in machinery or apparatus for tentering or stretching woollen and other fabrics.* Patent dated February 10, 1854. (No. 332.)

This invention consists in the employment of links, chains, or bands, fitted with hooks, upon which the fabric is to be hooked and stretched, and which pass over or through fluted rails or rollers in their passage through the machine for either tentering and drying, cutting, or raising woollen and other fabrics.

BIRD, GREGORY, of Glasgow, Lanark, North Britain, manufacturing chemist. *Improvements in the sub-structures or foundations of buildings.* Patent dated February 11, 1854. (No. 336.)

These improvements "relate to a mode of obtaining secure, dry, and impermeable substructures or foundations in buildings of various kinds by the use or application of asphalte or asphaltic compositions. When the foundation trenches are prepared, the bottom is laid with a mixture of asphalte or asphaltic composition, and broken stone, slag, shingle, or other similar materials."

JENNINGS, JOHN, the younger, of Lorton, Cumberland, flax-spinner and thread manufacturer. *Improvements in breaks for railway and other carriages.* Patent dated February 11, 1854. (No. 337.)

This invention consists in attaching breaks to the buffers of railway carriages, and to carriages for common roads, in such manner that the backing of the horse may bring them into action. In conveyances of two wheels, a slide is to be employed in addition to the breaks, which will allow the body of the vehicle to move back on the axle in descending a hill, thereby lessening the weight on the back of the horse when a backward pressure is exerted; and in ascending a hill, the body of the vehicle is caused to move forward over the axle, so as to bring the weight more over the back of the horse.

BUSSAC, JACQUES FRANCOIS DUPONT DE, of Upper Charlotte-street, Fitzroy-square, Middlesex. *Certain improvements in paving and covering places.* Patent dated February 11, 1854. (No. 340.)

This invention mainly consists in the production of a new mastic or cement, having a metallic base, by placing natural mineral bitumen and natural asphalte in the usual proportions, in a cauldron, and in adding to them when they are melted and well mixed together a suitable quantity of mineral ore powdered more or less finely.

AYRES, GEORGE, of the City-road, London. *An improved clip or file for holding papers or other articles.* Patent dated February 13, 1854. (No. 341.)

*Claim.*—The use of spiral springs in the construction of clips or files for holding papers or other articles.

EDWARDS, THOMAS, of Broad - street, Birmingham, Warwick, leather goods manufacturer. *A new or improved fastening for articles of dress.* Patent dated February 13. 1854. (No. 343.)

This fastening consists of two rigid strips or bars attached to the two parts of the article of dress to be fastened together, and connected to, or disconnected from each other by means of hooks.

CAMPBELL, DANIEL, and JAMES BARLOW, of Accrington, Lancaster, machinists. *Certain improvements in looms.* Patent dated February 13, 1854. (No. 345.)

This invention mainly consists in effecting the disengagement of the loom from the driving power, when the supply of weft from the shuttle is interrupted by means of the action or of the cessation of the action of the weft upon a tumbler in the shuttle operating in concert with mechanism attached to the loom.

CLEGG, EDMUND, of Rochdale, Lancaster, flannel manufacturer, and EDMUND LEACH, of the same place, machine-maker. *Improvements in slubbing, spinning, drawing, twisting, doubling, and winding wool, cotton, silk, flax, and other fibrous substances.* Patent dated February 13, 1854. (No. 346.)

*Claims.*—" 1. A peculiar shaped bobbin, from which we can take the slubbing or roving to be spun without the operation of rewinding; and 2. A method of spinning from the tops of the spindles with the lifter or liberator, and the other necessary apparatus connected therewith."

COX, JAMES, of Wenlock-road, Middlesex, engineer and manufacturer of paper-cutting machines. *Improvements in knives for cutting paper and other materials.* Patent dated February 13, 1854. (No. 347.)

This invention is intended to facilitate the cutting-out of the blanks used in the manufacture of bags, and consists in forming the cutting edge of the knife in such manner that an angled cut is effected vertically throughout the entire pile of paper, each sheet being then ready for folding into a bag.

SMITH, JOHN BURT, and EDWARD SMITH, both of Regent-street, Middlesex. *Certain improvements in bonnets.* Patent dated February 13, 1854. (No. 351.)

This invention consists in forming bonnets in such manner that they may be opened

out and laid flat in a case; and this is effected by connecting the flat, crown, and front together by means of loops, buttons, strings, &c., instead of by sewing, as is ordinarily the case.

BURY, THOMAS, WALTER GLOVER, JAMES WILLIAM SPEED, and JOHN HARDMAN, all of Salford, Lancaster. *Improvements in machinery or apparatus for stretching, drying, and finishing yarn and woven fabrics composed of cotton, wool, silk, or other fibrous materials.* Patent dated February 14, 1854. (No. 353.)

This improved machinery mainly consists of two cylinders which approach each other, and over which the hank or material to be stretched, dried, and finished is placed; the cylinders are then caused to recede from each other, thereby stretching the material, and remain stationary for a short time, if necessary, for the purpose of drying, and fixing the stretch of the material more effectually by means of steam or heated air. The cylinders then approach each other, the material is taken off, other is put on, and the process repeated.

SCALING, WILLIAM (of the firm of Messrs. Kitching and Scaling), of Old Basford, Nottingham, basket manufacturers. *Improvements in machinery for cutting and ornamenting skeins to be used in the manufacture of baskets and other wickerwork.* Patent dated February 14, 1854. (No. 354.)

*Claim.*—The employment in machinery for cutting and ornamenting skeins to be used in the manufacture of baskets and other wickerwork of sliding-gauge guide-plates, a frame, cutter, and weighted lever, and certain cover plates, or either of them, in combination with one or more pairs of knives for cutting both edges of a wicker skein, and ornamenting the upper side thereof.

FAURE, LOUIS, of Paris, France. *Improvements in the process for manufacturing iodine.* Patent dated February 14, 1854. (No. 355.)

*Claim.*—The application of sulphurous acid and chlorine to treating the mother liquors of nitrate of soda for the extraction of iodine therefrom.

HOLM, CHARLES AUGUSTUS, of Cecil-street, Strand, Middlesex, civil engineer. *Improvements in propelling.* Patent dated February 14, 1854. (No. 356.)

This invention consists in the propulsion of bodies by means of an apparatus in which the propelling power is entirely concentrated within such apparatus, and which being attached to the body to be propelled, gives motion to vessels, carriages, or other bodies. A full description of it will hereafter be given.

IRVING, THOMAS, of Mould-green, near Huddersfield. *Improvements in obtaining a metallic and lustry appearance to fabrics and yarns.* Patent dated February 14, 1854. (No. 357.)

This invention consists in subjecting fabrics and yarns to solutions of salts of tin, zinc, silver, and to cyanogen and steam.

PERKES, SAMUEL, of Walbrook, London, civil engineer. *Improvements in valve-cocks.* (A communication.) Patent dated February 14, 1854. (No. 358.)

This invention relates to valve-cocks for drawing off liquids, and consists in forming the body of the cock with a horizontal partition, which divides it into two compartments, and in which is an opening which receives a valve. This valve has a stem which passes through a tube, forming part of the cover of the opening into the body of the cock, and the upper part of the tube is formed into a stuffing-box.

JONSON, ARTHUR, of Mitcham, Surrey. *Improvements in preparing barley and grits, or groats.* Patent dated February 14, 1854. (No. 359.)

These improvements consist in causing the passages through which the heat is conveyed to the oven or drying apparatus to be surrounded in a casing, in such manner that the air may pass through the casing, and from thence into the oven or drying chamber.

O'CONNER, PATRICK, of Wavertree, near Liverpool. *An improved lever hinge for suspending and closing doors and gates.* Patent dated February 14, 1854. (No. 359.)

The peculiarity of this hinge is that the lever is weighted in such manner as to produce the desired effect.

HOSSELL, JOHN, of Regent-road, Salford, Lancaster, leather manufacturer. *Improvements in machinery or apparatus for washing, scouring, and squeezing leather or other similar substances.* Patent dated February 15, 1854. (No. 362.)

The inventor describes apparatus consisting of a revolving barrel fitted with internal flaps or dashers, into which barrel the materials to be washed are placed, (together with potash, pearlash, or other suitable substance), and of rollers, between which the materials are afterwards passed.

POTTER, JOHN, of Manchester, civil and consulting engineer. *An improvement or improvements in machinery for preparing, spinning, and twisting cotton or other fibrous substances, applicable also to machinery for winding threads or yarns of the same.* Patent dated February 15, 1854. (No. 363.)

This invention consists of a new winding-on motion composed of certain parts, "the first of which is a pair of bevil drums or mechanical arrangement answering the same purpose, by which the necessary variable velocity is given to wind the slubbing, rov-

ing, or yarn, on to the varying diameters of the spools, bobbins, or cops. The second is the arrangement of bevil or spur-toothed wheels, known as 'White's Differential Motion.' The third is a sliding rack that carries the guide which guides the strap on the bevil drums, and which sliding rack is connected to the fourth part of the apparatus, which is a variable lever, to which is attached a weight or spring, by the action of which it regulates the tension of the slubbing, roving, or yarn, during the process of winding on, and also the position of the strap on the bevil drums."

ASBURY, WILLIAM, of Birmingham, Warwick, engineer. *An improvement or improvements in forks for agricultural and other purposes.* Patent dated February 15, 1854. (No. 364.)

*Claim.*—Making the prongs of forks used for agricultural and other like purposes of separate pieces of steel, and connecting the said prongs together by riveting or otherwise fastening them to a transverse bar or head-piece made of any suitable metal or alloy, but by preference of malleable or annealed cast iron.

HINE, BENJAMIN HORNBUCKLE, and ANTHONY JOHN MUNDELLA, of Nottingham, manufacturers, and WILLIAM ONION, of Nottingham, mechanic. *Improvements in machinery for the manufacture of textile and looped fabrics.* Patent dated February 15, 1854. (No. 365.)

This invention consists in the employment in rotary frames of moveable frame and machine needles working in fixed combs, and of moveable sinkers working in the same combs, and actuated by curved plates in combination with a sliding presser and thread guide. This arrangement enables two courses to be performed in the time occupied for each course in the old frames.

JENNINGS, THOMAS, of Brown-street, Cork, Ireland, mineral water manufacturer. *Improvements in stoppers for bottles.* Patent dated February 15, 1854. (No. 367.)

This invention consists in constructing stoppers with a hollow plug of wood as a core.

WREN, JOHN, of Tottenham-court-road, Middlesex, iron bedstead manufacturer. *An improved construction of folding chair bedstead.* Patent dated February 15, 1854. (No. 368.)

*Claim.*—"A mode of applying the arms of the chair to the seat frame, whereby I am enabled, when required, to fold the arms down, on to, or under the seat, for the convenience of packing."

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company. *Improvements in preparing an oil, and in the manufacture of candles and night-lights.* Patent dated February 15, 1854. (No. 369.)

This invention consists in means of preparing East India fish-oil, and in applying the same to the manufacture of candles and night-lights. For this purpose, the inventor causes heated steam to be passed through the oil, and acidifies, distils, and subjects it to pressure, or not, according to the degree of hardness desired.

VARLEY, CROMWELL FLEETWOOD, of Charles-street, Somers Town, Middlesex. *A new arrangement or apparatus for transmitting electric telegraph signals.* Patent dated February 16, 1854. (No. 371.)

The inventor describes a key arrangement for reversing the currents, and discharging the line-wire between each alternation; and another arrangement, by which the switch at every move relieves the line-wire of its induced charge. This invention also embraces the use of a galvanometer "for a pecker, whose local circuit contact is made by rubbing against a spring, thus making very small power sufficient for telegraphic purposes, the deflectors for contact being assisted by gravity, the reverse current overcoming gravity, and holding back, thus using the *sum* instead of the *difference* of the acting forces."

GREENWOOD, JOHN, of Irwell Springs, near Bacup, Lancaster, Turkey-red dyer, and ROBERT SMITH, of Bacup, manufacturer. *Improvements in sizeing, stiffening, and finishing textile materials or fabrics.* Patent dated February 16, 1854. (No. 373.)

This invention relates—1. To the use of linseed mucilage in sizeing, stiffening, and finishing textile materials; and, 2. To the use of linseed mucilage, along with other substances, in sizeing, stiffening, or finishing textile fabrics.

STIRLING, JOHN DAVIE MORRIES, of the Larches, Camphill, near Birmingham. *Improvements in the manufacture of steel.* Patent dated February 16, 1854. (No. 375.)

The inventor claims the manufacture of cast steel, by melting cast iron with successive quantities of oxides of iron, and the use of zinc, tin, antimony, or bismuth for modifying the character of cast steel.

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company. *An improvement in the manufacture of lubricating matters.* Patent dated February 16, 1854. (No. 377.)

This invention consists in the employment of palmine, combined with other fats and matters, in the manufacture of lubricating materials.

FAWCETT, THOMAS, the younger, of Lisburn, Antrim, Ireland. *Improvements in weaving linen or other fabrics to produce plaits*

*or folds therein.* Patent dated February 17, 1854. (No. 378.)

The object of these improvements in weaving is to produce plaits or folds in linen or other textile fabrics with a thread running through each plait or fold, so as to resemble and supply the place of fabrics folded and stitched by hand, as shirt fronts, for example.

MACNEILL, THOMAS TELFORD, of Mount Pleasant, Lowth, Ireland, civil engineer. *Improvements in drying flax, straw, and other organic substances.* Patent dated February 17, 1854. (No. 379.)

This invention consists in drying flax, straw, and other organic substances, by means of a current of warm air, obtained by blowing air over a fire into a chamber containing the substance to be dried, from which chamber the moist air is withdrawn at the lower part.

SMITH, GEORGE, junior, of Belfast, Ireland, civil engineer. *Improved machinery for retarding and stopping railway carriages.* Patent dated February 17, 1854. (No. 383.)

This invention consists in distributing, by means of springs, the pressure of breaks worked by a crank motion, and (when employing blocks as brakes) in connecting the blocks to the crank motion by an arrangement of levers, forming a kind of parallel motion, intended to ensure the perfect contact of all parts of the friction surface of the brakes with the wheels.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BRIDGES, HENRY, of Bridgewater, Somerset, carriage superintendent. *Improvements in buffers for railway-carriages or wagons.* Application dated February 10, 1854. (No. 330.)

These improvements consist in enclosing a coiled metallic India-rubber or other spring in a cylindrical box or case, which is made to slide within an outer cylinder or case, by which it is supported, and prevented from bursting or bulging when any undue strain is put upon it.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of metallic pens.* (A communication.) Application dated February 10, 1854. (No. 333.)

This improved pen consists of a flat piece of thin metal, formed with recesses or hollows on each side for holding the ink, the point of it being ground and finished on both sides.

MARCESCHEAU, ARMAND JEAN BAPTISTE LOUIS, civil engineer, of Paris, France. *Improvements in locomotive engines.* (Partly a communication.) Application dated February 11, 1854. (No. 334.)

The inventor applies to locomotives two auxiliary wheels, which are arranged so that they may either be caused to roll upon the ground, and sustain a portion of the weight of the locomotive, or raised from it.

BUCHAN, PETER, of Peterhead, North Britain, Esq. *Improvements in apparatus for measuring and indicating the distances traversed by carriages.* Application dated February 11, 1854. (No. 335.)

This invention consists in the employment of a train of spur-wheels placed in connection with the running-wheels of a carriage on the driving-shaft of steamships.

GETTY, JOHN, of Liverpool, Lancaster, ship-builder. *An improved mode of plating iron vessels.* Application dated February 11, 1854. (No. 338.)

The inventor first covers the ribs of the vessel with plates arranged so as to break joint, and having their edges brought flush together, so as to form butt-joints. On this covering of plates (which are attached to the ribs by fastenings just sufficient to retain them in place,) he overlays another set of plates, which break joint with the former, and having punctured holes in the two sets of plates corresponding to the lines of bolt-holes in the ribs, he bolts through the three thicknesses.

ROGERS, JOHN, manufacturer, of West 21st street, New York, United States. *The preparation of asphaltum, coal tar, resin, resin oil, naphtha, and turpentines, for the manufacture of lamp-black.* Application dated February 11, 1854. (No. 339.)

This invention consists in "the combination of asphaltum, coal tar, resin, resin oil, naphtha, and turpentine with unslacked lime finely ground, or similar substances, as potash, soda, or the carbonates of potash or soda forming similar combinations, and using the substances so prepared for the manufacture of lamp-black in the usual manner."

BROWN, WILLIAM, engineer, of Albany-road, Old Kent-road, Surrey. *Improvements in printing machinery.* Application dated February 13, 1854. (No. 342.)

*Claims.*—1. The general arrangement of the machine. 2. The use of a second platten, by printing the second side of the same sheet. 3. The use of steel endless bands, steel cones, and pins. 4. The application of paper cylinders. 5. The forward movement only of the bands of paper, and an arrangement of the motion for ditto. 6. The application of the crank motion to the movement of the roller-frames.

CHALMERS, ALEXANDER, of Dundee, Scotland, blacksmith. *Improvements in*

*mangles.* Application dated February 13, 1854. (No. 344.)

This invention "consists in regulating the elastic pressure applied to the rollers used in mangles, by means of a spiral spring fitted on each side of the machine below the rollers, and made to act upon them with more or less elastic force, through the agency of a bar or link worked by an adjusting-screw."

BROWN, SAMUEL RUSSELL, of Glasgow, Lanark, North Britain, manufacturer. *Improvements in printing textile fabrics and other surfaces.* Application dated February 13, 1854. (No. 348.)

This invention relates to a system of relief or surface printing, especially applicable to the printing muslins and other goods with outline devices or figures, which are to be worked or embroidered by a subsequent operation in the production of what are technically known as "sewed muslins." The pattern or device is primarily produced in intaglio, in wood, or other material, by the use of "Wright's Mould-making Machine," or other contrivance suitable for producing sunk figures. This forms the mould or matrix, from which a cast is taken in type-metal, gutta percha, or other material; the casting or counterpart so produced being in the form of a flat plate, with the pattern in the relief upon it. These relief or surface-painting plates are then bent round a roller or curved surface, and attached thereto, producing the relief-printing roller or cylinder.

MACNAB, WILLIAM, of Greenock, Renfrew, North Britain, engineer. *Improvements in steam engines.* Application dated February 13, 1854. (No. 349.)

These improvements relate to trunk engines. "A single front trunk or hollow rod or case is used for the connecting-rod to work through. The piston is solid; that is to say, it has no central passage through it; and the connecting-rod joint is on the front side, or on the side next the crank-shaft. A solid piston-rod is attached to and projects from the opposite side of the piston, being secured or otherwise attached to the piston's centre."

GREENWOOD, JOHN, of Irwell-springs, near Bacup, Lancaster, Turkey-red dyer. *Certain improvements in dyeing textile materials or fabrics.* Application dated February 13, 1854. (No. 350.)

These improvements consist in the employment of the mucilaginous matter of linseed, together with colouring matter for dyeing purposes.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of protecting iron from oxidation.* (A communication.) Application dated February 13, 1854. (No. 352.)

In carrying out this invention, a paint is produced by grinding plumbago, pulverized charcoal, and the black soot formed by the burning of bituminous coal or other bituminous matter, together with ivory-black or lamp-black, either with water, weak spirits, vinegar, or any acetous preparations, until the mixture is very fine. The iron surface is then cleansed, coated with the mixture, heated, and passed through suitable rollers.

WILSON, GEORGE, of Sheffield, York, merchant. *An improvement in axle-boxes.* Application dated February 13, 1854. (No. 360.)

This invention is intended to facilitate the renewal of the brasses, and instead of making the brass bear directly against the top of the box, as is usually the case, the inventor interposes between the two a filling-piece or wedge suitably shaped to retain the brass in position by means of a lip or other projection, which, bearing against the brass, will prevent it from moving in the direction of the length of the axle.

BARRETT, OCTAVIUS, of Wimpole-street, Middlesex, gentleman. *An improvement in the construction of tobacco pipes.* Application dated February 15, 1854. (No. 366.)

"The barrel of the pipe at its large end, by which it is usually filled and lighted, I cover," says the inventor, "with a grating of small holes, and the air passing through these keeps the burning tobacco alight. At the end of the bowl into which the stem enters, I have another opening, through which I put the tobacco and there light it."

PRESTON, FRANCIS, of Manchester, spindle and flyer maker. *Improvements in flyers for machinery for preparing flax, and certain other fibrous materials.* Application dated February 16, 1854. (No. 370.)

These improvements are applicable to flyers that are used without pressers, and consist in the application of a ring to the lower extremities of the legs of the flyer. The fibrous material to be wound on the bobbin, after passing down the flyer leg, is twisted one or more times round the ring, and is then guided to a bobbin through a hole in the ring.

BUSH, JOHN, of Derby, locksmith. *Improvements in locks and lock furniture.* Application dated February 16, 1854. (No. 372.)

The inventor makes a socket to receive a spindle fitted with a projecting collar, which spindle has a flange on the end turned up all round to keep it in position. The rose has two or more screw pins, which pass almost through the door, and are met on the other side by a corresponding number of female screws, into which they are secured;

the spindle then passes through into the socket in the handle and requires no screw to fix it.

SUMMERFIELD, THOMAS, of Birmingham, Warwick, glass manufacturer. *The manufacture of chromatic, glass, and glass-faced bricks, which said bricks are applicable to face-work or fronts of buildings, basements, pilasters, string courses, door and window heads, medallions, cornices in part or whole, or other purposes where a superior finish and durability are required, a part of which is also applicable to bricks made wholly of clay.* Application dated February 16, 1854. (No. 374.)

The inventor prepares common clay and presses it into moulds of the desired shape and size in the ordinary way, and after this places the brick so moulded edgeway into another mould of the same length and thickness, but a little deeper, containing a colouring compound, consisting of the mixture usually employed in the making of glass; he then dries and burns the bricks in the usual way. He also makes bricks of compounds resembling marble, &c., and forms others in such manner that the mortar connecting them is hidden by projections formed at their edges.

PRITCHARD, JAMES, of Portsea, Hants. *Improvements in the construction of screw propellers and machinery for driving the same.* Application dated February 16, 1854. (No. 376.)

The inventor constructs propeller blades "with the middle portion only perpendicular, or at right angles to the central axis, and the other parts, as they depart from the middle of a blade, depart from being perpendicular to the central axis."

FORD, ALFRED, of Lowndes-street, Belgrave-square, Middlesex, surgeon. *Certain improvements in manufacturing varnish.* Application dated February 17, 1854. (No. 380.)

Burgundy pitch, dissolved in turpentine or in drying oil, forms the basis of Mr. Ford's improved varnish.

ROSS, HENRY, of Nottingham, gentleman. *Improvements in machinery for the manufacture of textile and looped fabrics.* Application dated February 17, 1854. (No. 381.)

These improvements consist in the employment of a point bar to receive the loops, and carry them on to the needle-beards, instead of using a presser-bar, or in causing the points to press the needle beards down while the sinkers knock the loops over the beards in the usual way, thus saving the time occupied in pressing the needles in the ordinary way.

## PROVISIONAL PROTECTIONS.

### *Dated July* 13, 1854.

1544. Robert James Maryon, gentleman, of York-road, Lambeth, Surrey. Improvements in the construction of, and arrangement of, and application of, steam engines for the better means of transmitting motion, and of applying steam or other motive power.

### *Dated July* 25, 1854.

1628. Hugues Champonnois, of Chaumont, civil engineer, and Jean Baptiste Baveller, of Dijon, manufacturer. Improvements in the manner of treating beetroot, and all other sugary and feculent vegetables.

### *Dated July* 29, 1854.

1680. Edwyn John Jeffery Dixon, of Bangor. Improvements in apparatus for teaching reading and arithmetic.

### *Dated August* 3, 1854.

1704. Henry Gerner, of Moorgate-street, London, architect. Improvements in the construction of omnibuses, parts of which are applicable to carriages generally.

1706. Charles Tetley, of Thurlow-villas, Dulwich, Surrey. Improvements in rotatory engines to be worked by steam or water.

### *Dated August* 4, 1854.

1708. Edward Hallen, of Cornwall-road, Lambeth, Surrey. Certain improvements in chairs, chair-bedsteads, and other seats and bedsteads.

1710. Maurice Atkinson Dayley, of London-street, Fitzroy-square, Middlesex, professor of ventilation. Improvements in furnaces for the purpose of consuming smoke and economizing fuel.

1712. Edmond Hamilton, of Edinburgh, Midlothian, gentleman. Improvements in the manufacture or production of beverages or occasional drinks.

1714. Charles Weightman Harrison, of Richmond, Surrey, electric engineer. Improvements in obtaining and applying electric currents, and in the treatment of certain products derived in obtaining the same, part or parts of which improvements is or are applicable to the production of motive power.

### *Dated August* 5, 1854.

1716. Charles Frederick Stansbury, of the firm of Nourse and Co., of Cornhill, London. Improvements in machinery for making rope. A communication from William Robinson, junior, of Warsaw, New York, United States of America.

1718. Charles Frederick Stansbury, of the firm of Nourse and Co., of Cornhill, London. Improvements in cut nail machine. A communication from Thomas H. Barlow, of Lexington, Kentucky, United States of America.

1720. John Cunningham, of Beith, Ayr, card-perforator. Improvements in the preparation or production of printing surfaces.

1722. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of railway and other wheels. A communication from Hippolite Ulysse Petin and Jean Marie Gaudet, of Rive de Gier, France, manufacturers.

### *Dated August* 7, 1854.

1723. George Wagstaff Yapp, of Cornhill, London. An improvement in steam boiler and other furnaces.

1724. Edouard Alexandre, organ-builder, of Paris, France. Improvements in concertinas.

1725. George Addison Cox, of Lochee, Dundee, Forfar, power-loom linen manufacturer. Improve-

ments in machinery or apparatus for winding yarns or thread.

1726. Jean Baptiste Toussaint Aubert and Fedele Antonio Cossus, of Paris, merchants. Improvements in obtaining fibre from woollen rags.

1727. John Hall Brock Thwaites, of Bristol, dentist. Improvements in apparatus to facilitate the communication by cypher.

1728. John Knight, of Stamford, Lincoln, engineer. Improvements in engines to be worked by steam, air, or other fluids or liquids.

1729. Emmanuel François Duquesne, of Brussels, Belgium. An improved mode of manufacturing gas for illumination.

1730. Samuel Lucas, of Dronfield Foundry, near Sheffield, York, steel converter. An improved mode of manufacturing steel.

*Dated August* 8, 1854.

1731. Henry Dircks, of Moorgate-street, London, engineer. Improvements in steam engine boiler furnaces and other furnaces for the prevention of smoke.

1732. Thomas Waterhouse, of Sheffield, York. Improvements in machinery for cutting files. A communication.

1733. Hugh Stoy, of St. John's-road, Battersea Rise, Surrey, yeoman. Stopping of engines and carriages on railways, and also vehicles of every description on the common roads.

1734. Joseph Hulme, of Manchester, engineer. Improvements in apparatus for preventing the explosion of steam boilers, for measuring the pressure of steam and other fluids, and in heating water for the supply of steam boilers.

1735. Henry Turner, of Leeds, York, leather-merchant. Improvements in preparing hides, and in cutting them into straps for driving machinery.

1736. Henry Moorhouse, of Denton, Lancaster, tailor. Improvements in certain parts of machinery or apparatus used in preparing cotton, wool, or other fibrous materials to be spun.

1737. Charles White, of Tatchbrook-street, Pimlico, Middlesex, paper-stainer. Improvements in printing-blocks for printing ornamental or decorative paper.

1738. Antoine Corvi, organ-builder, of Paris, France. Improvements in musical instruments.

1740. Edward Webb, of Worcester, hair-cloth manufucturer. An improved power loom for weaving horse-hair, and other fibrous substances where the weft or shoot is not composed of a continuous thread.

1741. William White, of York Villa, Kensington-park, Bayswater, consulting chemist. An improvement in deodorizing the contents of cesspools, privies, and also like matters in other places.

*Dated August* 9, 1854.

1742. William Charles Pitt, of Pimlico, Middlesex. Improvements in the construction of knobs and roses, used with locks, latches, and such like fastenings as are constructed with spindles. A communication.

1743. Thomas Kaye, of Grange Moor, Whitley Lower, near Dewsbury, York. Improvements in the means of reversing the direction of motion of steam engines.

1744. Plato Oulton, of Dublin, gentleman. Improvements in obtaining motive power.

1745. William Armand Gilbee, of South-street, London, gentleman. Improvements in hydraulic machines. A communication.

1746. Jean Baptiste Ambroise Marcelin Jobard, of Brussels, Belgium, director of the Museum of Industry at Brussels. A new system of pump.

1747. John Lucas, of Lincoln, agricultural-implement maker. Improved machinery for pulping or reducing vegetable substances.

1748. John Livesey, of New Lenton, Nottingham, lace-maker. Improvements in the manufacture of fringes.

*Dated August* 10, 1854.

1751. Edward Wills Uren, of Fogginton, Dartmoor, Walkhampton, Devon. A new or improved machine and arrangements of machinery for the manufacturing of bricks, pipes, tiles, and artificial stone from clay and other plastic materials.

*Dated August* 11, 1854.

1753. Samuel Bickerton, of Oldham, Lancaster. An improved gas-light governor or regulator, which invention is also applicable to regulating the supply of water and other fluids.

1755. Peniston Grosvenor Greville, of Lombard-street, London, gentleman. Improvements in the manufacture of cards for working wool and cotton. A communication.

1757. John Tennant, of Shields Monkton, Ayr, farmer. Improvements in grubbers for agricultural purposes.

*Dated August* 12, 1854.

1759. Thomas Cox, of Southampton-street, Strand, Middlesex, church warehouseman. Improvements in stools, cushions, and hassocks.

1761. Thomas George Taylor, of King's Arms-yard, London, steam share broker. The use or application of the stalk of the hop plant in the manufacture of paper, pasteboard and millboard, cordage, rope, and textile fabrics.

1765. John Benjamin Daines, of Charles-place, De Beauvoir-square, Middlesex, gentleman. An improved mode of treating surfaces of stone, plaster, and cement, for the preservation of the same from decay.

*Dated August* 14, 1854.

1767. James Tolputt Stoneham, of Manchester, Lancaster, manager. Improvements in the mode or method of rendering woven fabrics waterproof, and in the substance or composition used for the purpose.

1769. Joseph Moore, of Manchester, Lancaster, silk manufacturer, Samuel Beswick, of Failsworth, in the same county, warehouseman, and Benjamin Wilson, of Woodhouses, in the same county, weaver. Certain improvements in the manufacture of piled goods or fabrics.

1771. William Todd, of Haywood, Lancaster, manufacturer, and Jacob Todd, of the same place, overlooker. Certain improvements in power-looms for weaving.

1773. Henry Smith, of Smethwick. Improvements in the manufacture of wrought iron wheels.

*Dated August* 15, 1854.

1775. John Greaves, of Birmingham, Warwick, manufacturer, and Charles Michael Greaves, of Birmingham, manufacturer. An improvement or improvements in the manufacture of certain kinds of spectacle frames.

1777. John Norton, of Cork, esquire. Improvements in bolts and projectiles for fire-arms.

*Dated August* 16, 1854.

1779. Robert Caunce, of Bolton-le-Moors, Lancaster, cashier. Certain improvements in machinery for preparing cotton and other fibrous materials.

1781. Thomas Atkins, senior, civil engineer, Oxford. Improvements in the mode of preparing land, constructing machinery, and other apparatus for applying and maintaining an under current arterial circulation of fluid manure, gases, vapours, and air to the seeds and roots of plants.

1785. Samuel Frankham, of Greenland-place, Middlesex, engineer. Improved means of consuming smoke and economizing fuel in furnaces.

1787. William Kennard, of Little Queen-street,

Holborn. Improvements in attaching door or other knobs and handles.

1789. William Siddons, of Birmingham, Warwick, gun lock maker. Improvements in locks for guns and other fire-arms.

1791. Edmond Hamilton, of Edinburgh, Mid Lothian, gentleman. Improvements in the manufacture or production of beverages or occasional drinks.

1793. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in furnaces and in the consumption or prevention of smoke. A communication from Edme Lambert, of Troyes, France, merchant.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1823. Henry Bauckham, of New-walk, St. John, Southwark, Surrey, engineer, and Howard Glover, of the same place, engineer. Certain improvements in constructing an apparatus or instrument for securing or fastening corks or stoppers into bottles and other vessels, used to contain effervescing or other liquors, or wet or dry ingredients, and for other similar purposes. August 19, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," August 29th,* 1854.)

895. John Frearson. Improvements in steam engines.

920. William Harcourt and Joseph Harcourt. Improvements in chamber or flat-bottomed candlesticks.

924. Henry Bernoulli Barlow. Improvements in manufacturing metal nuts, and in machinery for stamping, forging, and punching the same. A communication.

928. Joseph Gill. Improvements in apparatus for the distillation of spirituous liquors.

932. Charles Emilius Blank. Improvements in winding or reeling yarn into hanks. A communication.

949. John Lawson and Somerville Dear. Improvements in looms for weaving.

970. Joseph Porter and Richard Howson. Improvements in forge hammers.

1029. George Barry Goodman. Improvements in apparatus for holding together letters, music, and other loose sheets. A communication.

1049. Henry Tylor. An improvement in chair bedsteads.

1143. Thomas William Atlee and John Jobson Atlee. Improvements in printed or other forms, applicable for bankers' cheques, orders for goods, wharfingers' and carriers' receipts, taxes and rate collectors' receipts, and various other parochial, commercial, or private purposes, whether such forms be bound up into books or not.

1182. William Stenson, junior. Improvements in steam-engine valves.

1523. Matthew Townsend. Improvements in the manufacture of knitted fabrics.

1542. Rudolph Bodmer. The application of glass, crystal, or other vitreous material or of earthenware (céramique) to certain parts of machinery. A communication.

1628. Hugues Champonnois and Jean Baptiste Bavelier. Improvements in the manner of treating beet-root, and all other sugary and feculent vegetables.

1711. Samuel Lawrence Taylor. Improvements in constructing and arranging the beaters and dressing machinery of thrashing machines.

1720. John Cunningham. Improvements in the preparation or production of printing surfaces.

1725. George Addison Cox. Improvements in machinery or apparatus for winding yarns or thread.

1727. John Hall Brock Thwaites. Improvements in apparatus to facilitate the communication by cypher.

1735. Henry Turner. Improvements in preparing hides and in cutting them into straps for driving machinery.

1742. William Charles Pitt. Improvements in the construction of knobs and roses, used with locks, latches, and such like fastenings as are constructed with spindles. A communication.

1748. John Livesey. Improvements in the manufacture of fringes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed August* 25, 1854.

475. Richard Archibald Brooman.
477. Leontide Aglaee Pallegoix and Alexandre Louis Bellange.
478. Theobald Denny.
482. John Henry Retré.
491. John Soden Holbeche.
528. Richard Madeley.
533. David Barr.
649. Perceval Moses Parsons.
805. Alfred Tylor.
1135. Louis Sautter.
1252. Somerville Scott Alison.
1515. Thomas Frederick Henley.

*Sealed August* 29, 1854.

514. John Tann.
519. John Nicholson.
526. Charles Nightingale.
538. Thierry Hubert de Nivelles.
550. George Beardsley.
558. William Warne.
565. William Beckett Johnson.
583. Désiré Parfait Lefèvre.
653. John Bird, junior.
669. Richard Roberts and George Coppock.
677. John Healey, John Foster, and John Lowe.
693. Benjamin Fothergill and William Weild.
699. James Robertson.
717. William Hähner.
719. William Hähner.
721. John Henry Johnson.
1164. Joseph Harrison.

1237. William Edward Newton.
1361. William Edward Newton.
1451. Walter Greenshields.
1513. Paul François Aerts.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| Aug. 10 | 3626 | J. Thomson | Redditch | Crochet Needle. |
| 15 | 3627 | W. Howlet | Fenchurch-street | Type Slip. |
| 16 | 3628 | S. Starkey | Clapton | Garden Engine. |
| 22 | 3629 | W. Jacobs | Dorchester | Hat Brim. |
| 24 | 3630 | Baker and Finnemore | Birmingham | Penholder. |
| 29 | 3631 | C. P. Poole | Canonbury-square | Shirt. |

## LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| Aug. 9 | 593 | J. James | Caledonian-road | Shirt. |
| 11 | 594 | T. Neaves | Mile-end | Derrick Beam. |
| 18 | 595 | R. Edwards | Bow | Perforated Polisher. |

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1622.] SATURDAY, SEPTEMBER 9, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## HATTERSLEY'S FORGING MACHINE.

Fig. 2

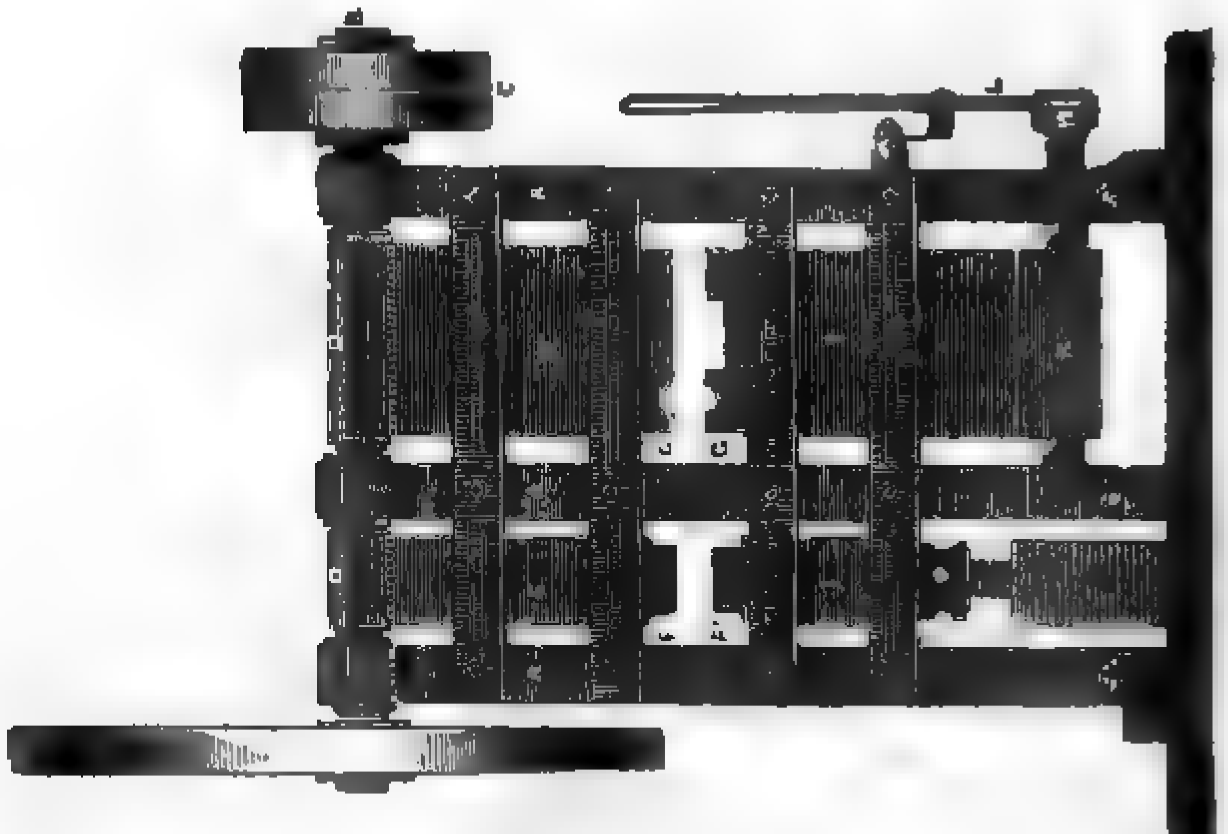
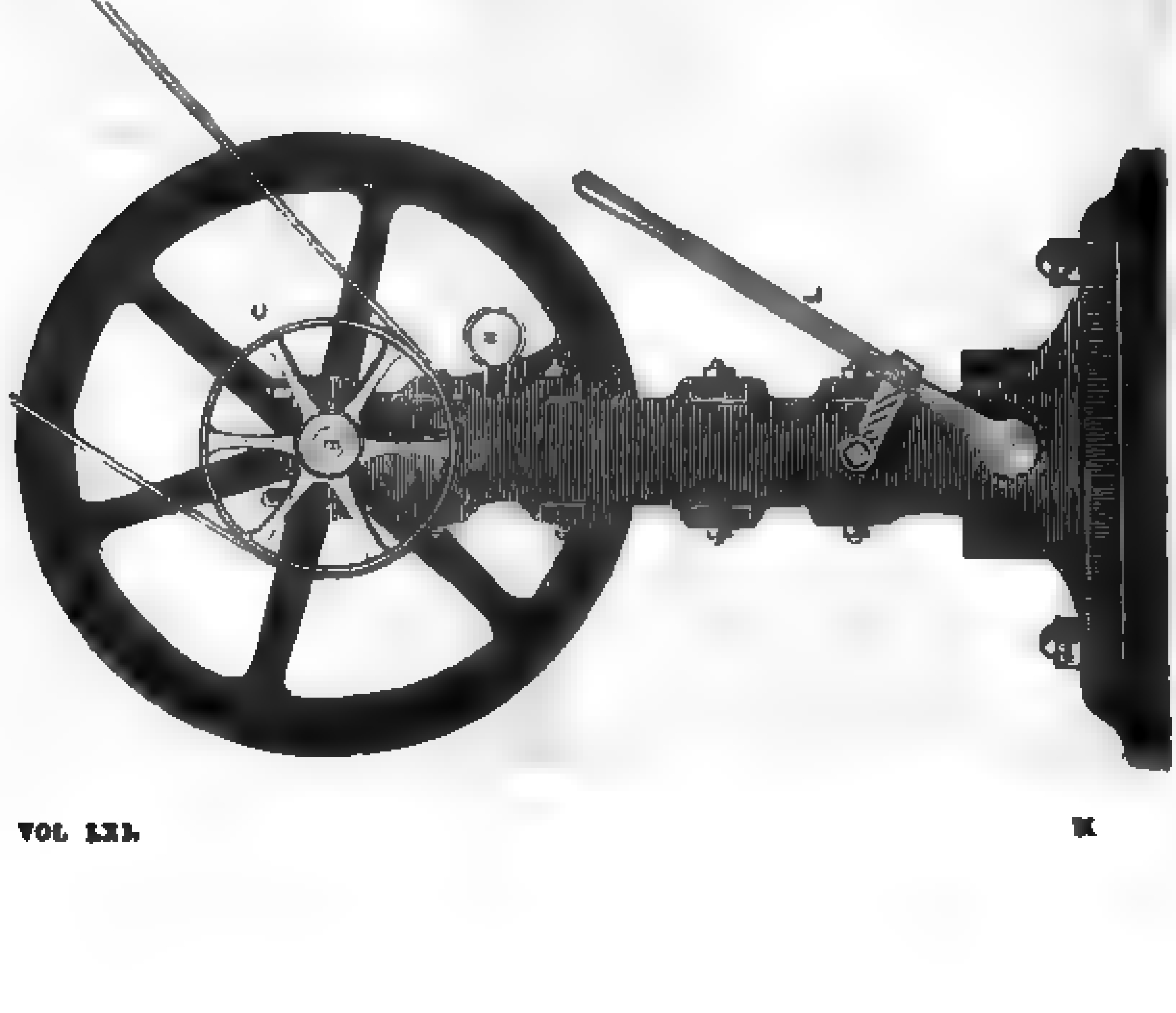


Fig. 1.



## HATTERSLEY'S FORGING MACHINERY.

MR. R. L. HATTERSLEY, of Keighley, has patented certain improvements in machinery for forging iron and other metals, which consist in combining the swages or dies or hammers, between which the forging operation is performed, in such manner as considerably to simplify it, and to reduce the length of time necessary to form the article, so that in most cases it may be forged and shaped at one heat of the metal.

The engravings on the preceding page illustrate these improvements as adapted to one of that class of forging machines, known as "Ryder's machines." Fig. 1 represents a front, and fig. 2 a transverse elevation of one of these machines. Fig. 3, the face of the upper combined swage; fig. 4, the face of the lower one; and fig. 5, a vertical section of the upper and lower combined swages and swage-bars through the line 1——1.

In describing this arrangement, the patentee says, "It will not be necessary for me to more than briefly describe those parts of the machine and their action, which do not form my present improvements. Upon the general framing, A, of the machine is mounted the horizontal eccentric or cam-shaft, B, which is driven in the ordinary manner by the usual fast and loose pulleys, C, the eccentrics D, D, upon this shaft, during its revolutions, by their action upon the bars, E E, give a rapid vertical movement to them, they duly sliding in guides upon the framework of the machine; these bars are the upper swage-bars, their lower ends being socketed to receive the stems of the swages, F, G; the swage-bars are provided with springs, H H, by which they are raised and supported after each downward action of the eccentrics; the lower swages, F¹, G¹, are in like manner attached to the lower swage-bars, I, I, and these have screwed connections at their lower ends to adjust their respective heights; the lower swage-bar, carrying the ordinary flat swage, is supported upon some elastic medium, so as to give a certain amount of elasticity to the lower swage, and reduce the concussions arising from the action of the machine; the lower swage-bar, carrying the combined swage, rests upon an eccentric or cam, K, upon a shaft which has a lever handle, L, upon its outer end, and is for the purpose of raising the lower swage when required.

"Hitherto, in forging or shaping articles by mechanical means, a separate and distinct pair of swages or dies were used for each process or form of the forging operation, and each of these pairs of swages were mounted on its own separate and distinct swage-bars; thus the drawing down of the metal was effected by one pair of swages, the formation of any boss or projection upon the article by a second pair, the cutting off from the bar or rod of metal by a third pair, and so on for each separate process; the time thus consumed in moving the article from swage to swage is considerable, and does not enable the article to be formed at one heat of the metal, entailing considerable expense and inconvenience.

"By my improvements the faces of the swages being in combination, and closely adjacent to each other, and connected to the same swage-bars, enables me to transfer the bar or rod of iron, or other metal under operation, from one pair of surfaces to another in rapid succession, and with such economy of time, as to forge and shape the article at one heat of the metal, and in a better and more uniform manner than by the ordinary means.

"The surfaces of the pair of combined swages, as represented in one modification at figs. 3 and 4, are of a form intended to forge the central portions of flyers employed in machinery for spinning and doubling fibrous materials; but of course their form must be such as will produce the article intended to be produced."

He then goes on to describe the manner of forging, by means of this machinery, the central portion of a flyer employed in spinning and doubling fibrous materials: "The bar or rod of steel or iron, or other metal from which it is to be formed, being heated to the required temperature, is taken by the workman from the furnace, and the end of it is placed between the swage surfaces at M, the lower swage is raised by the eccentric, K, by the workman moving the lever handle, L; this forms in a rough state the boss of the flyer at a short distance from the end of the bar or rod; it is then removed immediately, and that portion of the bar between the end of it and the rough boss just previously formed is then drawn down by the surface or flat swages, F, F¹, to the desired diameter or size; it is then removed and placed at N, so that upon the descent of the upper swage by the action of the shaft above, and the ascent of the lower one by the action of the eccentric below, by the workman moving the lever handle, the end before drawn down, the roughly formed boss, and a length of the bar or rod sufficient to form the second end of the flyer will be cut off by the cutting surfaces of the swages from the bar or rod; the piece thus cut off is now taken up, and the second end of the flyer is then drawn down to the desired diameter or size, as the first one was, by the action of the surface or flat swages, F, F¹; it is then again removed, and placed between the swages at O, in such a manner that the rough

boss before made shall be placed directly over the recesses in the swage, so that upon the descent of the upper swage, and the ascent of the lower one, as before described, the metal will take the form of the recesses in the swages, and shape the boss of the flyer accordingly; the flyer thus forged may then be further drawn or swaged out, bent, and fitted in the ordinary manner. The whole of the above movements follow in rapid succession, so that

Fig. 3.

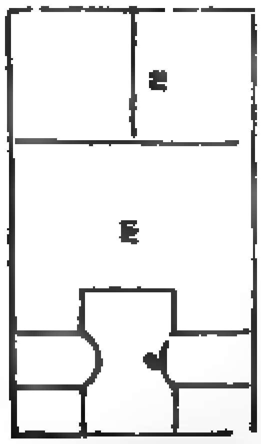


Fig. 4.

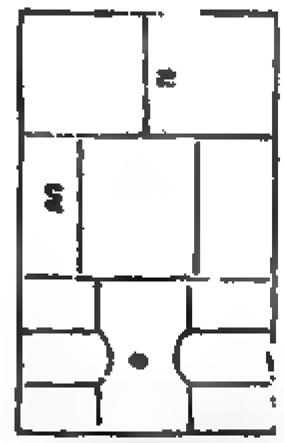
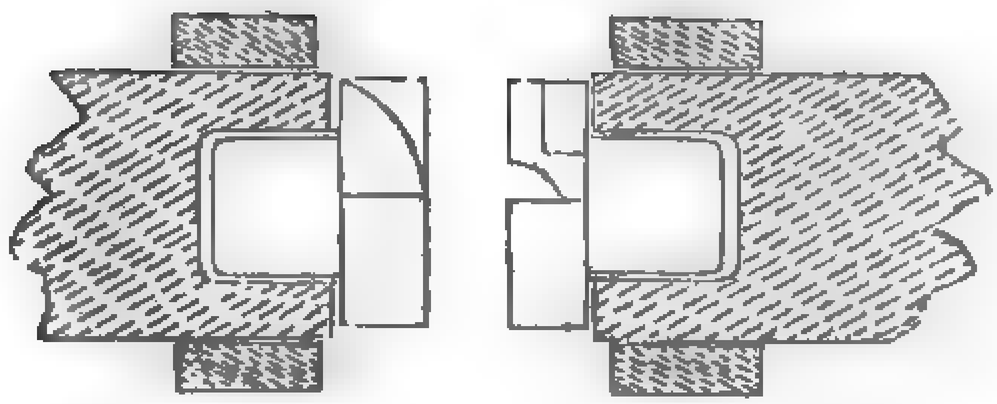


Fig. 5.



the forging of the flyer is effected whilst the metal retains a sufficient degree of temperature, without the necessity of re-heating it to complete the operation, though it is not essential that it should be so, as for very small flyers, or other like articles, it may be requisite in some cases to re-heat the metal before the article is completely forged."

## NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S., and Corresponding Member of the Manchester Literary and Philosophical Society.)

NO. IV.

(*Continued from vol. lx., page 126.*)

Professor Dalby, of the Royal Military College, at Farnham, is well known as a constant contributor to the mathematical periodicals for almost half a century. An interesting autobiography, written by himself to a friend, appears in the fifth volume of *Leybourn's Repository*, and an excellent portrait of him was published by Fisher, Son, and Co., in 1827, from the original portrait in the Military College. In 1770, he was resident at Stroud, in Gloucestershire, where he was engaged in tuition, and on "September 11th" of that year he addressed a letter to the editors of the *Town and Country Magazine*, containing an answer to the *fourth* mathematical question in that journal, "with a new one to be proposed" in their next number. This letter is still extant; from which it appears that the question related to the then favourite subject of constructing triangles from given data, which was pursued with such ardour by the English mathematicians of that period. The question he proposes is somewhat curious, and is here transcribed for the consideration of the readers of this Magazine:

*Problem.*

Given the altitude of a right elliptical cone $=20$ inches; the transverse and conjugate diameters of the base $=6$ and $4$ inches respectively:—to determine where it must be cut so as to divide it into two equal parts, and that the figure of the section may be a circle.

I have not been able to ascertain the

exact date when mathematical questions began to be proposed and answered in the *Town and Country Magazine;* but from the date of Mr. Dalby's letter, I apprehend it must have been about July, 1770. This mathematical department was under the superintendence of Mr. Samuel Clark, author of a treatise on the *Laws of Chance*, and editor of the *Diarian Repository*, a publication professedly issued in opposition to Dr. Hutton's edition of the *Ladies' Diary*. In the number for April, 1774, I find the name of Mr. "Thomas Molineux, of Mr. Henry Clarke's school, at Salford, near Manchester;" and he afterwards published a good treatise on Arithmetic, in two volumes, when he was assistant-master at the Macclesfield Grammar-school. The names of Bonnycastle, Barker, Beck, Vyse, author of a treatise on Arithmetic, and Ryley, also occur about the same period; but Mr. Clark never seems to have had a numerous staff of contributors, owing probably to his constitutional virulence, and to the severe nature of his attacks upon almost every other mathematician. A few of his criticisms are subjoined, in order to enable the reader to understand some allusions in several letters to be noticed hereafter.

Both the "*Huttonian Miscellany*," and "Mr. Professor Hutton," are spoken of with much contempt in the Magazine for July, 1774, and in the October number the problem of finding the longest pole which can be put up a chimney is reproposed from the *Miscellany*, in consequence of "Mr. Thomas Day" having found "Mr. P. H.'s solution quite false." In October, 1775, "the new method of drawing asymptotes to curves, proposed by Mr. Professor Hutton, in his *Mathematical Miscellany*, page 213," is said to be "not generally true;" but owing to some failure in his proofs, the editor in the number for June, 1776, offers some remarks "to clear our Magazine from the *unjust* censure passed upon the mathematical part of it by the editor of a certain miscellany." During this year, I again meet with the name of "Mr. Robert Abbatt, of Preston, in Lancashire," who I now find answered Question 682, in the *Ladies' Diary*, and also the Prize Question in the same work for 1783. Another Lancashire mathematician, "Mr. Ralph Lowe, of Wigan," appears in 1776, and during the same period I find "Mr. John Ryley, assistant in the Rev. Mr. Thomas's private school at Beeston, in Yorkshire." Mr. Ryley here solves a very neat case of *Sectio Rationis;* he afterwards distinguished himself in pure geometry, became the editor of the early portion of the *Leeds Correspondent*, and founded the Yorkshire school of geometers, whose merits have been so well described by the late Professor Davies in No. 57 of *Notes and Queries*. Mr. John Whitley, one of the most distinguished of the Yorkshire geometers, was a correspondent to this magazine in June, 1776, being then "a pupil to Mr. John Drurey, at Leeds, in Yorkshire;" and a charge of "*carelessness*" is preferred against "Professor Hutton" with regard to the questions in the *Diary*. This charge appears to have been preferred on the ground that one of the *Diary* correspondents had written a *three* instead of a *six*, thereby bringing out the result only half of what it ought to have been. In the supplementary number to this volume, Mr. Clark professes to have received an anonymous letter, and he presumes that "Gaffer John (this letter-writer's signature) may be a professor of mathematics; nay, he may likewise be F.R.S. for ought we know to the contrary." His *good manners* are then called in question for having abused the editor "very undeservedly." During the year 1777 various questions from *Burrow's Diary* are reproposed for solution. The prize in that work, for 1776, is said to be erroneously solved by Messrs. Dalby and Burrow, and other failures in the Prize Question for 1777, are pointed out by Mr. John Ryley when solving the case of it, when P lies in the line AB, in the magazine for July. In September, the *Monthly Reviewers* are severely rated in consequence of their "abuse so liberally bestowed upon the author of a letter to Dr. Price," wherein his *Treatise on Reversionary Payments* is said to be "mathematically defective throughout." Mr. Samuel Clark takes up the subject in the following number, and asserts somewhat confidently that "there is not an individual among them (*the reviewers*) with sufficient merit to be collated ordinary of Newgate." The names of "Mr. Joshua Hitchen, of Samlesbury, Lancashire," and that of the Rev. John Lawson occur in the supplement to this volume, where also Dr. Price and the "Lottery System" are exposed—the latter by Mr. Ryley. It may also be observed, that "Mr. John Fletcher," of Hollinwood, or Oldham, is not the "John Fletcher," of Chester or Nantwich, since *both* names appear to solutions in the same number of this magazine.

In 1779, Mr. Clark renews his attacks upon the character and abilities of Dr. Hutton. Most probably he would feel irritated at the non-success of his *Diarian Repository*, and would hence be glad of an opportunity to retaliate upon an opponent, who not only occasionally exposed his deficiencies, but had also conducted a successful edition of the same work to its termination. By a question sent by a correspondent, Mr. Clark declares that "the leading prin-

ciples of Bridges, published about six years since, *by one Charles Hutton*, of Newcastle, in a very despicable performance upon that subject, are refuted in the clearest manner. We do not, however, imagine Mr. Professor Hutton, F.R.S., and the above-mentioned obscure writer, notwithstanding the coincidence of their names, to be one and the same person;" more especially "since the Professor has had the gold medal of the Royal Society conferred upon him for a dissertation on the Velocity of Cannon Balls." The question is, "to determine (granting sufficient data) the absolute force with which a proposed arch of equilibration, whose intrados is an arc of a circle, endeavours to overturn the supporting the piers." It was reproduced in the May number by "Mr. Stevens," and is introduced by the following remark: "N. B.—A solution of this question, *the most absurd ever exhibited to public view*, may be seen at p. 54, of Hutton's *Treatise on the Principles of Bridges*, where, contrary to reason and experience, it is pretended that the height of the piers makes no alteration in the drift of the arch."

The October number takes objection to the solutions on p. 42 of the *Ladies' Diary*, "by Charles Bumpkin" (Mr. Landen) and "Mathematicus;" the former are said to be "unfortunately not true, and the latter mere nonsense." On the appearance of the new *Diary*, a series of objections are taken to the correctness or propriety of the solutions, and the same system of disparagement is continued in succeeding years. Almost every number of the magazine contains a running commentary on the *Diary;* but the frivolous nature of most of the objections merely serves to show that Mr. Clark omitted no opportunities of annoying Dr. Hutton. By the editor's remarks on the solution to the Prize Question for 1779, it would appear that "Peter Puzzlem" (Mr. Landen) was equally obnoxious to Mr. Clark, and in one instance, Mr. John Ryley is spoken of as assisting in these attempted exposures of Dr. Hutton's incapacity, both under his own name and under cover of the anonymous "Rev. Mr. Brookes." All such "fault-finding contributions, however, are denied admittance into the October number," it being "the opinion of our contributors in general that the said Diaries are too despicable to deserve notice in the *Town and Country Magazine.*" I think *other* and more *weighty* reasons can be assigned for this specimen of Mr. Clark's wisdom — the editor was shortly after obliged to make a public apology to Mr. George Sanderson for having pronounced a solution of his "to be totally false," which he "afterwards found to be quite correct!!!"

The publication of Dr. Hutton's dissertation in the *Phil. Transactions* for 1780, art. xxv., gives occasion for another illiberal attack upon his abilities, which are here termed puerile and of no moment; and on the Rev. Samuel Vince publishing his paper "On Rotatory Motion," this "young gentleman" is gravely advised to relinquish all such studies, and "become a divine, without mathematics or natural philosophy." From some remarks in Dr. Henry Clarke's *Rationale of Circulating Numbers*, I am led to suppose that a rupture took place between himself and the "Editor of the mathematical department of the *Town and Country Magazine*," about 1777; for in subsequent numbers of the work, he is almost as much abused as Dr. Hutton himself. The occasion of the quarrel appears to have arisen from the liberties which Mr. Clark took with the private letters of his correspondents, and the practice is thus exposed in a note to the *Rationale*, previously noticed.

"This question I proposed (as No. 689) in the *Ladies' Diary* for 1775, to which a solution is given in the *Diary*, for the year following, by Mr. Rowe; but by a mistake at the conclusion of it, he has brought out the required area of the ellipse only about one half what it ought to be. The same question was re-proposed by the conductor of the mathematical department of the *Town and Country Magazine*, for August, 1776; occasioned chiefly, I imagine, by the mistake in Mr. Rowe's solution. And here, in order to do justice to the author of the *Diary* and myself, I am under the disagreeable necessity of informing the reader, that the note subjoined to the solution of this question in the magazine for the month following contains assertions that I *never wrote or even once thought of;* which the following letter will evince, being copied *verbatim* from that I sent with the above solution to the editor of the *Town and Country Magazine:*

"'Sir,—As it will be naturally expected that I should offer a solution to my own question, I have here sent one nearly the same with that I gave to the author of the *Diary*. The restriction you speak of is certainly right, but I thought it rather unnecessary to mention it, because it is obvious to every one that either this limitation must be understood, or the situation of the pedestal in the periphery given; otherwise the question would be absolutely unanswerable. Mr. Rowe's solution is on the same principle as the above, but is rendered false, I observe, by a mistake in the conclusion of it, having put down $3 \times {\cdot}7854$ instead of $6 \times {\cdot}7854$; this latter expression bringing out the same numbers as the above.

"'I am, Sir, &c.,

"'HENRY CLARKE.'

"I remember Terence somewhere says, '*Veritas odium parit*;' which perhaps may be the case here; but notwithstanding this, I cannot help observing, that whoever compares this letter with the note before mentioned, will hardly forbear tearing it out of the magazine as a downright falsehood. It is a pity that this entertaining and curious miscellany should be prostituted to such low purposes in the mathematical parts, as to be a vehicle for malevolence and spleen. The reproposing of this question in the magazine being evidently only another weak effort to depreciate, if possible, the mathematical character of the present author of the *Ladies' Diary*—for which purpose, it seems, *truth or falsehood* is equally subservient."

In February, 1784, a notice appears in the magazine to the effect that the mathematical questions are postponed, "on account of the decease of the gentleman who had the management of that department." Mr. Samuel Clark was therefore dead, and with him all the animosity he had manifested towards his contemporaries. Few of these would regret his departure, nor would many at the present day refuse to endorse the opinion of Dr. Clarke, so far as regards the means he took to annoy them. The mathematical department was resumed under different management in June, 1784, and an improvement for the better is evident at the outset, both in matter and manner. "Amicus of Nuneaton" (Nathan Parnel), is a correspondent—"Salfordoniensis" (Dr. Clarke) reappears—and both John Farey and Jonathan Mabbott contribute to the November number. Some good *geometrical* questions occur in this volume, and the contributors gave good promise for more; yet, although in January, 1785, "mathematical correspondents are requested to transmit their favours as early as possible," I cannot find that any more questions or solutions were ever inserted.

(*To be continued.*)

## ON THE ELECTRIC CONDUCTING POWER OF HEATED INSULATORS.

BY W. BEETZ.*

THE accounts given by several physicists concerning the property which many substances possess of passing from the condition of insulators to that of conductors, by increase of temperature, have reference to bodies so heterogeneous that it appears almost impossible to reduce the phænomena to one cause. Davy's experiments* prove that the conducting power of metallic conductors is decreased by heating them; whilst, according to Ohm's observations,† a decrease of resistance takes place in electrolytic conductors under similar circumstances. Hence the passage of a body by means of heat from the condition of a non-conductor, that is, of a very bad conductor, to that of a conductor, or better conductor, can be very well explained if the body be a compound one, but not at all if it be an elementary one. In the following pages I have described the experiments, by means of which I hope to have secured a common point of view for all these several statements.

Of the elementary bodies which are liquid at the usual temperatures, the one, quicksilver, deports itself in every respect as a conductor of the first class, and hence, as shown by E. Becquerel's‡ measurements, its conducting power is decreased by heating. The other, bromine, according to Balard's experiments,§ is a non-conductor of galvanic electricity; a stratum from three to four lines thick, when introduced into the circuit of a battery, caused every perceptible action in a decomposition apparatus to cease. De la Rive‖ obtained the same result, and mentions at the same time that, according to a verbal communication of Faraday's, liquid chlorine is a non-conductor, and is not acted upon by a battery. Solly¶ found that bromine did not conduct, but was at first of opinion that chlorine was a conductor; after carefully washing the tube in which it was contained, however, he found it to be a perfect non-conductor. When sufficiently well freed from admixed water, I have also found bromine to be a perfect non-conductor of galvanic electricity. Those elements which are made liquid by fusion are generally *metallic* in the solid state, and consequently lose conducting power when heated. Of the non-metallic bodies, Faraday** has shown that liquid sulphur and phosphorus do not conduct; hence the statement of J. Inglis,†† that iodine conducts when fused, is quite unexpected. In this case the substance to be tested was contained in a glass tube, sealed at both ends, into which two platinum wires were conducted.

* Communicated to the Academy of Sciences, *Berlin, June, 1854*, and reported by *Philosophical Magazine for September.*

* Phil. Trans., 1821, p. 431.

† Pogg. *Ann.*, vol. lxiii., p. 403.

‡ *Ann. de Chim. et de Phys.*, 3 sér., vol. xvii., p. 234.

§ Ibid. vol. xxxii., p. 345; Pogg. *Ann.*, vol. viii., p. 123.

‖ *Ann. de Chim. et de Phys.*, vol. xxxv., p. 160; Pogg. *Ann.*, vol. x., p. 307.

¶ Phil. Mag., S. 3., vol. viii., p. 130; Pogg. *Ann.*, vol. xxxvii., p. 420.

** Experimental Researches, par. 405.

†† *Bibl. Univ. de Gen. Nouv.*, sér. i., p. 167; Phil. Mag., S. 3., vol. vii., p. 441.

Solly * contradicted this experiment; he could neither detect the slightest trace by Wollaston's method (in which the body to be investigated is introduced into a circuit, both of whose extremities consist of different metals, which can be placed on the tongue), nor could he observe any decomposition in a solution of iodide of potassium, by means of a battery of sixty elements, when the circuit was interrupted by a stratum of melted iodine $\frac{1}{10}$th of an inch thick.

Notwithstanding this, Palmieri, † relying upon the experiments of Inglis, and without mentioning those of Solly, has lately constructed batteries from three elementary bodies; for example, from two metals and iodine, wherein the latter takes the place of the electrolyte. If the statement concerning the iodine battery was not so simple as to preclude the possibility of error, I should pay no regard to this investigation, seeing that the same physicist constructs a battery equally well from three metals, one of which is mercury, whose action can evidently be ascribed to no other cause than to the moisture adhering to the mercury. A glass flask, which contained somewhat more than 1 ounce of iodine, was closed with a cork; the iodine was then fused, and air admitted several times during the process by removing the cork, after which two plates of platinum and iron, connected with a delicate galvanometer, were immersed in the liquid mass. The galvanometer at once announced a current traversing the wire from the platinum to the iron. No perceptible residue was at first obtained, when the iodine which had been used was evaporated on a platinum plate; after repeating the experiment several times, a small residue containing traces of iron was obtained. The action was still stronger when iodine was fused in a platinum crucible, and an iron plate dipped into it, the crucible and plate being both connected with the galvanometer.

In order first to come to a decision as to the fact of the conducting power of liquid iodine, I made the following experiment;—Two platinum wires, connected with a galvanometer, were immersed in a porcelain dish containing iodine, and the dish heated. As the iodine began to fuse, a deviation of the astatic system, amounting to about 15°, was observed; when the wires were immersed after the iodine had been fused, the deviation was somewhat less, probably because the wires became covered with a stratum of solidifying iodine. Conduction, therefore, although very little, certainly took place. In order to ascertain whether this conduction was metallic or electrolytic, the wires were so arranged as to be in connection with the battery in one position, and with the galvanometer in another. After the current had passed for some time from one wire through the oidine to the other, the two were connected with the galvanometer, when a deviation of the needle, amounting to between 1° and 4°, ensued, and always in the same direction as must have occurred in any ordinary galvanic decomposition. The conduction, therefore, was electrolytic, or at any rate partly so, and could not on that account be peculiar to the iodine itself. In order to ascertain whether a rapid solution of platinum in iodine furnished the small quantity of electrolyte which was here decomposed, the platinum wires were replaced by pieces of graphite, a substance employed by Faraday* as electrodes in the electrolysis of chlorides and iodides, because it was not acted upon by these bodies; conduction, however, still took place, which must have been caused by the slight impurity of the iodine. After twice subliming about an ounce of this substance at a gentle heat, so that each time only about half the quantity used was sublimated, the experiments were repeated with the thus purified iodine. The needle still deviated, but at most to 5°, when the fused iodine was introduced into the circuit which contained the galvanometer, and still the electrodes became charged. At length I sought to destroy the impurity in an electrolytic manner, by introducing the iodine into a glass tube, into which two platinum wires were led, and which was afterwards completely sealed up; the deviation decreased a little, but afterwards remained pretty constant, although a zinc and iron battery of six elements acted on it for three hours. The platinum wires remained polarized, but the conduction electrolytic to the last. On opening the glass and testing the iodine by evaporation, a small residue was obtained. Hence I think we may with certainty conclude, that the very small conducting power of purified iodine is due to the admixture of a small quantity of some volatile electrolyte (hydriodic acid?); but that during the continued action of the current the electrodes begin to be acted upon, and thus new, though very small, quantities of an electrolyte become mixed with the iodine, whilst this substance itself is a non-conductor. Hence there remains no elementary body which, when converted into the liquid state, becomes a better conductor.

Faraday's † beautiful experiments have

* *Ann. de Chim. et de Phys.*, vol. xxxv., p. 160; *Pogg. Ann.*, vol. x., p. 367.
† *Rendic. della R. Acc. de Nap.*, vol. ix., p. 161.

* Experimental Researches, par. 794.
† Ibid., Ser. V, and VII.

already thrown much light on the compound insulators, which by fusion become conductors; to a great extent they form but a higher class in the series of bodies which conduct at ordinary temperatures, and which at lower temperatures, on solidification, become non-conductors. Of these, water is an example. Franklin * and Achard † have shown that in its solid state, as ice, it insulates frictional electricity; and since then, Faraday ‡ found that its insulating action is still more decided towards galvanic electricity. Faraday, however, found some exceptions to the general rule, that the compound bodies, which by fusing have become conductors, still follow the law of fixed electrolytic action. In the several series of his Researches he has expressed several views of the deportment of these exceptional bodies, the most important of which are sulphuret of silver,§ periodide of mercury,‖ and fluoride of lead; ¶ bodies which, on increasing their temperature, become conductors, but which show no traces of decomposition. Hittorff's ** experiments on the first of these substances are so complete, that it is not necessary for me to enter on the same. Sulphuret of silver deports itself as an actual electrolyte, but at increased temperatures the separated particles of silver combine and form a metallic thread or covering, which connects both ends, and causes the whole conductor to become a metallic one. When the body cools, conduction ceases, owing to the rupture of this thread. To sulphuret of silver Hittorff adds another substance, sulphuret of copper, whose apparent metallic conduction he also reduces to an electrolytic one.

When publishing his Experimental Researches, Faraday, in a note to paragraph 448, concerning periodide of mercury, remarks, "It is just possible that this case may, by more delicate experiment, hereafter disappear." In paragraph 691 the case is, in fact, more carefully considered. "The case is an exception, and I think the only one, to the statement, that all bodies subject to the law of liquido-conduction are decomposable. I incline, however, to believe that a portion of protiodide of mercury is retained dissolved in the periodide, and that to its slow decomposition the feeble conducting power is due. Periodide would be formed, as a secondary result, at the *anode*; and the mercury at the *cathode* would also form, as a secondary result, protiodide. Both these bodies would mingle with the fluid mass, and thus no final separation appear, notwithstanding the continued decomposition." Lastly, however, in paragraph 1341, he says, "I have now very little doubt that periodide of mercury is a case of the same kind," (that is, a case in which a body, by fusion, assumes a conducting power of its own without decomposition.)

In order to purify periodide of mercury, it was also twice sublimated, and then placed for experiment in a glass tube, into one end of which a platinum wire had been before fused. The periodide of mercury was then retained for a long time in a state of fusion, and almost of ebullition, in order to dispel any moisture which might possibly have been enclosed; the other end of the tube was then closed, and a second platinum wire fused into it. Besides this apparatus, a galvanometer with a simple needle, and a silver voltameter were introduced into the circuit; and lastly, the two platinum wires could be connected at any moment by means of a commutator, with a second galvanometer containing an astatic system of needles. The glass tube filled with periodide of mercury was heated in a sand-bath. The salt began to conduct at about 110° before it became liquid; the commencement of conduction was simultaneous with that of the yellow colour which periodide always assumes immediately before fusing. From the first moment of conduction, a polarization of the platinum wires was observed on turning the commutator, thus disproving the hypothesis that this yellow periodide possesses conducting power without decomposition. The glass tube was now more intensely heated; the galvanometer needle retained a tolerably fixed position; the experiment was concluded in about an hour, and the glass tube broken open. Neither iodine nor mercury could be detected on either wire by any reagent, although 0·005 grm. of silver were precipitated in the voltameter, proving that about the same quantity of mercury and 0·006 grm. of iodine must have been separated. Nevertheless, the opinion which Faraday last expressed, that periodide of mercury possesses a peculiar power of conducting, could not be maintained, because the polarization proved the existence of a permanent electrolysis. I hoped, therefore, by a continued action to remove an electrolytic impurity which was perhaps mixed with the periodide; and to do this, I conducted a current from a zinc and iron battery of six elements for fourteen hours through a new apparatus of the same kind (containing about 8 grms. of iodine), taking care to preserve the mass in a liquid state. The galvanometer needle soon assumed a tolerably permanent position, from

* Experiments and Observations, p. 36.
† *Chemisch physische Schriften*, Berl., 1780, p. 11.
‡ Experimental Researches, par. 384.
§ Ibid., pars. 433, 437, 438, 1340.
‖ Ibid., pars. 414, 448, 91, 1341.
¶ Ibid., par. 1340.
** Pogg. *Ann.*, vol. lxxxiv., p. 1.

which it appeared to deviate only in consequence of changes of temperature. At the end of this time 0·162 grm. of silver were precipitated in the voltameter; the tube was opened, and even now no mercury was perceptible on the negative wire, but in the neighbourhood of the positive wire the mass was coloured black; and when pieces of the same were thrown on paper saturated with starch, the violet colour which the latter assumed was as intense as that produced by pure iodine itself. Inasmuch as the deviation of the galvanometer needle remained constant, the electrolysis cannot be ascribed to any impurity, or at most it may be due to an impurity which continually forms itself anew in the mass itself, that is, to protiodide of mercury, as Faraday formerly supposed. As, however, according to my experiments, free iodine was liberated, all the protiodide which may have been present in the vicinity of the positive wire must first have been converted into periodide; and if this had not itself conducted, the current would have been interrupted. In the first experiments, which were of short duration, this formation of periodide was evidently not complete. Once complete, however, the liberation of iodine proceeds rapidly, whilst protiodide is formed at the negative pole; hence periodide must, in fact, be an electrolyte. A quantitative determination of the separated iodine is here quite impossible, but apparently it was less than 0·190 grm., which, according to the voltameter, must have been separated; on this account I conjecture that a part of this iodine must have again combined with the protiodide which was contained in mechanical mixture. Accordingly a very small tube was filled with 0·182 grm. of periodide of mercury. After ten hours' action 0·098 grm. of silver were precipitated, according to which 0·114 grm. of iodine should have been set free. But the periodide only contained 0·101 grm. of iodine, and yet the deviation of the galvanometer needle had been almost constant, so that we are compelled to conclude that a recombination took place. This recombination also showed itself externally, for the limit of the black-coloured part lay far nearer to the positive pole than in the former experiment, although the quantity of iodine to be separated was not then double as great, and yet the breadth of the tube was much greater.

A second circumstance may also diminish the liberation of iodine. It is well known that the protiodide, by heating, is decomposed into mercury and periodide. When a galvanic current was conducted through heated protiodide, mercury was separated strongly at the negative pole; but within the mass, also, particles of mercury appeared, though certainly to a much less degree. This must also be the case with the protiodide which arises from the decomposition of the periodide, and is held by it in solution; branch currents may therefore be produced, for whose formation the existence of a thread of mercury joining the poles is not at all necessary. Only as much iodine will in every case be separated at the positive pole as corresponds to the branch current which passes immediately through the molten mass, and not through the mercury; whilst every electrolysis which takes place between two particles of mercury within the liquid conductor decomposes as much periodide on the one hand as it forms on the other, so that at most the position of the particles of mercury will be changed.

Of fluoride of lead, Faraday speaks still more definitely in par. 1340: "When a piece of that substance, which had been fused and cooled, was introduced into the circuit of a voltaic battery, it stopped the current. Being heated, it acquired conducting powers before it was visibly red-hot in daylight, and even sparks could be taken against it whilst still solid. The current alone then raised its temperature until it fused, after which it seemed to conduct as well as the metallic vessel containing it. . . . . . . During all the time there was scarcely a trace of decomposing action of the fluoride, and what did occur seemed referable to the air and moisture of the atmosphere, and not to electrolytic action." Fremy,* on the contrary, counts fluoride of lead amongst the decomposable salts.

At several different times I employed the greatest care in preparing fluoride of lead from fluoride of potassium and acetate or nitrate of lead. The electrical properties I found were almost exactly what Faraday had stated them to be, although the substance conducted far worse than metals, but far better than per-iodide of mercury. As soon as conduction commenced, the platinum plates in contact with the mass became polarized. As the mass began to fuse, a colourless gas escaped in small, but quite perceptible bubbles at the positive pole, around which the liquid had a brown colour. A grey body collected around the negative pole. The electrodes were examined after the process had continued an hour, during which time the galvanometer needle soon went back to a position of rest. The positive electrode was blackened and perceptibly acted upon. The black colour could not be diminished by boiling with fuming nitric acid or with potash. The negative electrode

* *Comptes Rendus*, vol. xxxviii., p. 393; *Journ. fur prakt. Chem.*, vol. lxii., p. 65.

had swelled out to a porous mass, in which I detected an alloy of lead and platinum; accordingly, the gas at the positive pole must have been fluorine, so that the decomposition was quite analogous to that of chloride of lead. In another experiment I found that 0·014 grm. of silver had been precipitated in the voltameter, whereas the negative electrode had increased 0·019 grm. (instead of 0·013); this may have arisen from an imperfect separation of the alloy from the surrounding liquid, in consequence of the brittle, sponge-like nature of the former. As, according to these experiments, fluoride of lead followed the laws of electrolytic action almost exactly, I began to fear that some other compound of lead might have been admixed, and thus have been electrolysed; by no re-agent, however, could any such compound be detected; and on allowing the current to pass through the fluoride of lead for six hours, the deflection of the galvanometer needle remained constant during the whole period. The experiment was repeated with a specimen of fluoride of lead, which M. H. Rose had kindly given me, and in which I also failed to detect any foreign substance; exactly the same results were obtained, so that fluoride of lead may decidedly be considered as an electrolyte.

Experiments on substances containing silicic acid, showing how their power of conducting commences when heated, have long since been made known. After Cavendish* had demonstrated this conducting power for frictional electricity in glass, and Delaval † in Portland and several other stones, Aldini‡ was able to produce contractions in a prepared frog by connecting the two metals which were placed on muscle and nerve by means of a piece of glass fused before the blowpipe. And although Ritter§ claimed an insulating power for red-hot glass, yet Pfaff|| received continuous shocks when, with both hands, he completed the circuit of a voltaic battery into which a glass tube, heated to redness, and almost to fusion, was inserted. Later, when he corroborated these statements, Ritter¶ proposed the following questions:—"Of what nature is the conducting power of those individuals of this class of bodies that ultimately conduct? Do they conduct in the same manner as water, or in the same manner as metals, that is, with or without decomposition, or more definitely in Volta's language, as conductors of the first or of the second class?" In the foregoing case this last question was exactly the one under discussion. For my first experiments I selected Fuch's water-glass, which, on account of its simple composition, may be considered as a type of all the other silicic-acid compounds. This glass was prepared without any addition of carbon, and was almost colourless, or white. A small narrow bar of it was placed on two strips of platinum, and strongly heated until it fused fast to them; it was then allowed to cool again. When cold, it conducted the current of a battery connected with the two pieces of platinum; when gently heated or dried over sulphuric acid, it was a perfect insulator. When strongly heated, but not to fusion, it became a good conductor, and from the first motion of the astatic system in the galvanometer which was introduced into the circuit, it was evident that the platinum plates were polarized. The same experiment was made with frictional electricity. Here, also, a polarization immediately ensued, which was similar to the one observed by Henrici* when passing the electricity of a machine through water. In order to determine whether to ascribe the counter currents which were formed to an electrolytic action, or to a deportment similar to that shown by imperfect conductors, a piece of water-glass, after the current of a battery had been passed through it for some time, was broken loose from its supports. Before, the glass had a weak alkaline reaction; this reaction was now no longer manifest at the end of the bar which had rested on the positive plate, but at the other it was strong. This substance, therefore, had deported itself, even before fusion, exactly as an electrolyte would have done.

After this, I proceeded to experiment upon common glass; the form generally employed was that of a thin tube, into which two platinum wires were fused, so as not to touch one another, in order to avoid every external influence. When a gentle heat was required, the sand-bath was used; when a strong one, the immediate action of a flame. The sand-bath could be well employed in all experiments; for the sand, even when strongly heated, conducted so badly, that it was only able to discharge a charged electroscope very gradually. The several kinds of glass which were employed began to conduct the galvanic current when between 200° and 220° C. (Becquerel† found this to occur only at 300°), when the wires became strongly polarized. In order to find whether an electrolytic action was

* Franklin's Experiments and Observations. London, 1774, p. 411.
† Priestley, *Gesch. d. Electr. Deutsch v. Krunitz*, 1772, p. 160.
‡ Aldini, *Versuche, ubers. v. Martens*, 1804, vol. ii., p. 76.
§ Gilbert's *Annalen*, vol. vi., p. 471.
|| Ibid., vol. vii., p. 249.
¶ Ibid., vol. ix., p. 299.

* Poggendorff's *Annalen*, vol. xlvi. p. 585.
† *Comptes Rendus*, vol. xxxviii, p. 905.

also present in this case, the experiment was made in the same manner as with the water-glass; a small glass bar was fused fast to two strips of platinum, and broken off after it had been exposed for two hours to the action of a current from a battery of six or ten elements; the end which had lain on the negative plate was rubbed smooth, and moistened with water; in two out of seven experiments a weak basic reaction was detected. As this experiment was not decisive, the glass bar, which had been thus fused to the two plates, and exposed to the action of the current, was broken off and replaced by a fresh one after the battery had been withdrawn from the circuit. A polarization current was always obtained when this bar was heated, thus proving that chemically-opposite changed substances had remained behind on the plates. Frictional electricity also presented the same phenomena of polarization, in a much less degree, it is true, but still always in the proper direction. In these experiments, however, the action of thermo-electric currents, which are produced by unequally heating the two places where platinum and glass are in contact, must be carefully avoided; for this reason the sand-bath was always employed here; the polarizations produced by the actions of galvanic currents are so strong, that I could never observe any disturbance caused by thermo-electric currents.

By means of a commutator I investigated the relation which exists between the polarization, the temperature, and the intensity of the current. Two glass bars were heated in the same sand-bath to 250° C., then through the one a current from a single element, through the other a current from two elements of a zinc and platinum battery was passed, until the polarizations each attained a maximum; both bars were afterwards made to produce opposite effects upon a galvanometer with which they were connected by means of a commutator. The polarization produced by two elements was strongest, and similarly it continued to increase according as four, six, or ten elements were employed. The magnitude of the polarization does not depend upon the acting force, but upon the actual intensity; and as this is still small in this case, it explains why, with so great an electromotive force, an increase of polarization always occurred.

Further, the same current was passed successively through a glass bar which was heated to 130°, and through a second heated to a cherry-red heat. By turning the commutator, it was found that the platinum wires which were heated to 130° were most strongly polarized. Accordingly, heated glass before it fuses behaves in every respect like other electrolytes; so that Becquerel's* pyro-electric battery differs from common batteries in no other respect, except that in the former the electrolytes have to be prepared by heat, whereas in the latter they are always ready at hand. We cannot estimate what advantage may be thus gained, inasmuch as the same intensity of current corresponds, in both kinds of batteries, to the same destruction of metal.†

By the foregoing investigations, therefore, the law that all bodies whose conducting power is increased by heating are electrolytes, is now freed from those exceptions which it appeared to suffer; neither is it necessary, although many may yet feel inclined to do so, to ascribe the apparently incomplete electrolysis to a double conduction, as Foucault has lately assumed, and as Faraday himself has already acknowledged. Even if the hypothesis of such a coexistence of two conductions involves nothing contradictory in itself, it is corroborated by no single experiment. The proofs submitted by Foucault in favour of his views may be considered as disproved by the opposite experiments of Buff‡. The experiments communicated by Foucault § at a later period are based upon an erroneous conception of the term branch-current; they can possess no weight whatever, inasmuch as formulæ dependent upon this erroneous conception have been improperly introduced into the observations. At any rate the above experiments show that, even in the weakest conduction by an electrolyte, the latter is electrolytic; and hence

* *Comptes Rendus*, vol. xxxviii. p. 905.

† Since completing, and for the most part writing down, the above experiments, I have received a memoir from Buff, which has yet to appear in the *Ann. der Chem. und Pharm.* (vol. xc. p. 257,) wherein the conducting power of glass is also examined. [See p. 12 of the present volume of this journal.] Although the experiments have been conducted quite differently, our results agree perfectly, *e. g.* in reference to the commencement of conducting power, to the polarization, and to its dependence upon the intensity of the current and the temperature. Whilst Buff arrived at the last by single measurements, wherein he had to assume the equality of the polarizations which, according to his own statement, had not quite constant values when the currents had different intensities, I discovered the same dependence by means of the commutator; nevertheless, the differences between the polarizations at different temperatures are so great, according to Buff's measurements, that we willingly overlook the small deviations from the proper values which are caused by introducing those slightly erroneous numbers into calculation. I may also mention, that early in April I had already communicated my results to many of my colleagues in Berlin. (To which I, for my part, gladly bear testimony.—Poggendorff.)

‡ *Annalen der Chemie und Pharm.* vol lxxxviii. p. 177.

§ *Cosmos*, vol. iv. p. 348.

that the co-existence of both kinds of conduction can never take place in the manner of branch-conduction, but at most that in the electrolysis every moving atom again conducts.

## THE VENTILATION OF METALLIC MINES.

BY HERBERT MACKWORTH, ESQ.

(*Continued from page* 223.)

NUMBERLESS are the methods of ventilation which have been proposed to the mining world, either depending on sinking shafts, at short distances apart, or on the forcing and exhausting air through air-pipes by machinery of various kinds. The first class of inventors have not discovered the fact that such is the relation of the cost and convenience of the excavation of lodes and seams, and of transport under ground, that where these are economically conducted, the galleries are generally sufficiently large and numerous to convey an adequate quantity of air to the miners, by properly arranging and using them, as already described, or by increasing artificially the means which nature itself has provided. The other class are not aware of the insuperable resistance of small air-passages, nor of the singular fact, that in a mine well arranged for ventilation (of which the Hetton Colliery has been given as an example) the highest amount of air yet attained by artificial means, or, in other words, by the consumption of a large quantity of coal, seldom amounts to more than double the quantity of air obtainable by natural ventilation alone. The explanation of this fact, and other interesting conclusions, I must arrive at by describing the means we have of measuring the resistance and the velocity of air.

I have shown how the upcast column of air, being lighter than the downcast, affords a pressure or pull to force or draw the air through the channels of the mine. Suppose, in lieu of this rope of air, there were a long spiral spring laid along the air-way, and some mechanical or other power were pulling it through: the spring at the end next the downcast would not be expanded, but towards the other extremity it would be necessarily so, the expansion at any point being an exact measure of the resistance offered by the air-way up to that point. The rope of air is far more highly elastic; and if we can only measure its expansion at any point,—as, for instance, the bottom of the upcast shaft, we thereby obtain the whole resistance of the air-ways up to that point. This can be done by a very delicate barometer, or by a more sensitive instrument, an air-pressure gauge, which I have contrived for the purpose. If the downcast and upcast shafts are near together, a simple means exists of measuring this expansion of air caused by the drag or resistance of the mine. If these two shafts communicate by a level, closed by a wooden division or door, a hole is bored through it, and one end of a water-gauge inserted; this consists of a bent glass tube, open at each end, but half filled with water. The greater density or pressure of air on the downcast side forces down the liquid in the nearest branch, and the difference of level between the surfaces of the liquid in the two branches is a measure of the difference of pressure or expansion on the two sides of the door. If the difference of level is 1 inch, this indicates a pressure on the surface of water contained in an imaginary tube a foot square of 5¼ lbs.—being the weight of a square foot of water an inch in depth. The resistance offered by the whole of the air-ways between the bottoms of the two shafts would be therefore very nearly 5¼ lbs. per square foot.

The next consideration is how to measure the quantity of air. The simplest, though a rough method of doing so, is to select a portion of an air-way of uniform size, through which the current to be measured passes. Let this be 6 feet high, 5 feet wide, and 50 fathoms in length: the quantity of air it will contain at any moment is 9,000 cubic feet. Then taking a candle, walk with the current, and at the same velocity (which may be done by moving so as to preserve the flame upright), and note the time occupied in passing from one end of the measured distance to the other. Suppose this is done in one minute, then the quantity of air passing through the air-way is at the rate of 9,000 cubic feet per minute. Another mode of measurement is by flashing off powder about five fathoms back from the beginning of the fifty fathoms, and by having persons stationed at each extremity, so as to call when the smoke reaches them. It is necessary to take two observations, one of the first part of the smoke which passes, and another of the last, and to adopt the mean velocity given by the two. The result is generally rather too high. Other means, sometimes adopted, are balloons, soap-bubbles, or the smoke from tinder; but the experiment can be most conveniently and accurately made by an instrument called an anemometer, of which there are three principal varieties now in use. Biram's anemometer, made by Mr. Davis, of Derby, is similar to a smoke-jack, or the ventilators occasionally used in windows: the angle of the vanes is so adjusted that the wheel makes one revolution for one foot lineal motion of the air, and these revolutions are registered

by dials in the centre of the instrument. Another variety, called after Monsieur Combes, the Inspector-general of Mines, at Paris, is on the same principle, and is generally used in France and Belgium. Instead of the windmill vanes there are four plates of thin metal or mica, each about half-an-inch square, fixed on radial arms, and at an angle to the wind. The motion of the axis is communicated to wheels, on the circumference of which figures corresponding to the linear motion of the air are marked. In the preceding methods it is necessary to ascertain the number of revolutions made in a minute by a watch or a bullet at the end of a string, sufficiently long to vibrate seconds. The third variety of anemometer requires no observation of time, and is that arranged by Mr. Joseph Dickinson, and made by Mr. Casartelli, of Manchester. It consists of a light square disc of metal, suspended on a pivot. The pressure of the air inclines it outward in proportion to the velocity, and the velocities are marked on the arc of a circle, up which the lower edge of the disc moves. Whenever anemometers are employed, it is not necessary to find a length of air-way of equal size, as the air can be correctly measured at any point; but it is always desirable to measure the velocity of the air at different points of the section of the air-way, as the middle air travels faster than the air near the sides, and it may sometimes happen that the lower part of the current is in an opposite direction to the upper. When the lineal velocity has been obtained by any of these methods, it is necessary to multiply it by the area of the air-way to obtain the cubic quantity of air passing.

We are now in a position to measure the power exhibited, or the useful work done in drawing the air through the mine. If, as before, the air-way be 30 square feet in area, and the resistance $5\frac{1}{2}$ lbs. per square foot, the total drag of the mine is $30 \times 5\frac{1}{2}$ lbs., and if the velocity of the current be 300 lineal feet per minute, then the work done is

$$\frac{30 \times 5\frac{1}{2} \times 300}{33000},$$

that is 1·42 horse power. The same result is arrived at by multiplying $9000 \times 5\frac{1}{4}$; that is, that the power expended in moving the air through any mine is ascertained by multiplying the number of cubic feet of air passed through per minute by the resistance per square foot. The resistance of the shafts is not included in observations by the water gauge. By numerous experiments I have found the law confirmed, that the resistance of air increases as the square of the velocity, or, what is the same thing, that the drag increases as the square of the amount of ventilation. Since the power is the drag multiplied by the ventilation, it is easy to prove mathematically what I have been able to show in practice, that the power usefully expended increases as the cube of the amount of ventilation. The total power, or the fuel required for the steam engine or other prime mover, in consequence of the necessary losses occurring in all of them, increases in a still higher ratio. To put the case more simply —to double any existing ventilation requires eight times the power, for 8 is the cube of 2. This explains why so large an amount of air can be obtained by natural ventilation in cold weather, as compared with the effect of the highest artificial ventilation. The law holds as true with furnace as with mechanical ventilation. Since, in the former, the ventilation varies as the square root of the difference of the temperatures of the two shafts, if these temperatures in natural ventilation be 40° and 65°, the difference being 25°, then to produce double the ventilation, the difference must amount to 100°, which gives a temperature for the upcast shaft of 140°, the temperature actually of some of the hotter furnace-shafts in ordinary work.

There are four principal kinds of artificial ventilating powers. The furnace acts by rarefaction, assisting the natural tendencies of the air; the steam-jet, partly by a similar rarefaction and partly by its propulsion, which assists in exhausting the air. Mechanical ventilators are of various kinds; pumps, fans, screws, and pneumatic wheels, of different economical values, according to the circumstances to which they are applied; some being good with a high velocity and small drag, others with a small ventilation and heavy drag; whilst small first cost and heavy maintenance, or large outlay with economy in use, distinguish other varieties one from the other. The fourth kind are the water-ventilators, which, unlike the others, are used oftener for forcing than exhausting air, and which are more applicable to metallic mines than to others.

The improvement of the present condition of the metallic mines, and the arrangement of the air-courses according to the practical rules already given, are the first and most important steps,—the most conducive to the welfare of the miner and the benefit of the proprietor. I believe I have entered sufficiently into a description of the condition of collieries to prove the perfect identity of their requirements, as regards ventilation, with those of other mines; to establish the applicability of all the improvements in the former, to ameliorate the condition of the latter; and to open out to the captains of the mines of the south-west of England, the advantages to be derived from a study of the numerous publications on the subject

of colliery ventilation. In no district has the economy of the steam engine been more studied or perfected, and in none would ventilation by means of machines, for the same reasons, be more applicable, or more likely to meet with economical application.

In some degree to supply a deficiency existing in published information on this subject, and to guide in the selection of a mechanical ventilator, which would be the most appropriate to the distinctive peculiarities of any given mine, I purpose to avail myself, on a future occasion, of the permission of the Society to describe the properties and limits of application of each machine, as resulting from experiments on those erected at various mines in England and abroad, which I have either myself made or had the opportunity of personally testing.

## ON THE DETERMINATION OF LONGITUDE BY GALVANIC SIGNALS.

A paper was recently read before the Cambridge Philosophical Society on the determination of the longitude of the Cambridge Observatory by means of the galvanic telegraph. The paper contained the details of an experiment which was made at the suggestion of the Astronomer Royal, and conducted according to a scheme arranged by him for giving and receiving the signals. A galvanic connexion having been established between the Greenwich Observatory and the Cambridge Telegraph Office, by means of the London central station of the Electric Telegraph Company, signals were sent on the nights of May 17 and 18, 1853, between 11h and 12h mean time. The signals were made by causing two needles, one at Greenwich, the other at Cambridge, to start by completing the galvanic circuit at either place of observation. The times of starting were noted at both places, and reduced to the sidereal times of the respective observatories, to serve by comparison for determinations of the difference of their longitudes. On each night the signals were made alternately for a quarter of an hour at one station, in batches containing an arbitrary number of signals, not exceeding nine, and then for quarter of an hour at the other station in a similar manner. On the first night the total number of signals was 151, and on the second night 139. The two observers, Mr. Dunkin of the Greenwich Observatory, and Mr. Todd of the Cambridge Observatory, changed places in the interval between the two night's observations; Mr. Todd observing at Greenwich, and Mr. Dunkin at Cambridge, on the second night. Also it was arranged that the two observers should observe identical stars on the two nights, as well as the stars ordinarily used for clock errors, and that the same apparent right ascensions of the stars should be employed for reducing the signal-times at both observatories. The Cambridge Observatory time was conveyed with the greatest care to the Telegraph Office at the Cambridge Railway Station by the transfer of three chronometers. By a first calculation, the longitude of the Cambridge Observatory was found to be 23s·03 east of Greenwich.

Professor Challis subsequently made another calculation, taking into account the effect on the times of meridian transits of stars produced by the forms of the transit-pivots, according to a method which he has described in the Memoirs of the Royal Astronomical Society (vol. xix. p. 103). The errors arising from the deviation of the pivots from the cylindrical form being eliminated, the longitude is found to be 22s·70 east of Greenwich, which is less by 0s·84 than the value hitherto adopted.

## GLASS FOR ACHROMATIC LENSES.

Marshall Vaillant recently presented to the *Academie des Sciences*, in the name of the author, M. de Peyrony, Captain of Engineers at Cherbourg, a memoir upon a new process in the manufacture of the glass of which the lenses of astronomical telescopes are made.

In the present state of this manufacture, the mass of the glass having been brought to a state of fusion in the crucible, the material is simply stirred to make it homogeneous and drive out the air included in it; but this double object is never completely obtained, and the stirring, as it is performed, itself occasions the formation of numerous striæ, which compels the rejection of a large part of the glass taken from the crucible, as unfit for the formation of lenses. Hence the difficulty of obtaining lenses of large dimensions.

M. de Peyrony thinks that he has found the solution of this difficulty; that is to say, a way of making glass free from faults, by giving to the crucible containing the fused mass a somewhat rapid motion of rotation around a vertical axis; the centrifugal force will, according to him, unite the air bubbles towards the centre of the glass, while the striæ made by stirring will, for the most part, disappear, and those that remain will be circular, and be productive of no inconvenience, if care be taken to make the axis of the primitive mass the axis of the lenses.

The editor of the *Journal of the Franklin Institute* says, "The improvement by this

process is not patent. The central part of the mass which it is proposed to throw away, is precisely the part which it is most desirable to preserve. And the idea of constructing a lense around an axis of the mass which is cut out as good for nothing, is probably more remarkable for novelty than excellence."

## FURNACES OF LOCOMOTIVE BOILERS.

BY ZERAH COLBURN.

In accordance with the principles explained in my article on the above subject, as published in the *Journal* for March,* I have designed a boiler of peculiar form, with a view to its introduction upon an important line of road, largely occupied in carrying anthracite coal. The object is that of burning anthracite as a fuel. It is well known to have been the effort of all the parties who have thus far attempted the adaptation of anthracite to locomotives, to attain to the largest practicable extent of grate surface. The objects sought in enlarging the grate are, to diffuse the action of the draught upon a larger surface of burning coal, thereby lessening the intensity of the fire at any one point; and also, by the same means, to lessen the destructive action of the intense heat upon the sides of the furnace. These objects have been generally appreciated as legitimate grounds for enlarging the grate, and I have therefore designed my boiler with reference to their attainment.

The boiler referred to has its furnace (rectangular in plan) placed entirely behind and clear of the driving-wheels. The walls of the fire-box, instead of descending perpendicularly from the barrel of the boiler, are inclined outwards sufficiently to give a width of grate as much as the objects contiguous to the track will permit. In the case under notice, the grate, for a gauge of six feet, is nine feet and six inches in width. A water-bridge, however, of three or four inches width, would probably be run across the furnace in the direction of the length of the engine. With a length, fore and aft, of four feet, which would be extremely convenient for firing, this would allow of 37 square feet of grate area, nearly 50 per cent. more than in the Baltimore-built engines.

As this form of furnace requires to be wholly behind the fire-box, it might throw the engine considerably out of balance, unless properly lengthened towards the forward end. To lengthen the boiler, however, would increase the friction surface, and consequently the back pressure, in the tubes, thereby requiring an increased action of the blast. But by suitably enlarging the diameter of the tubes, the absolute flue-opening is not only made greater, but is made much greater in proportion to the friction surface. In the boiler under notice, with a diameter of 51 inches, there are to be 109 tubes, 3 inches in diameter and 16 feet long. The heating surface will therefore stand as follows:

| | |
|---|---|
| 1370 | square feet tube surface. |
| 103¾ | „ „ fire-box „ |
| 37 | „ „ grate „ |

This gives one square foot of grate to every 40 feet of heating surface.

As the furnace is very shallow, the heat generated on the grate is received directly upon the crown sheet, from whence it is communicated to the water with less injury to the furnace than if acting upon a deep side sheet.

Some general notes of the engine may be interesting. It is expected to take a load of 300 tons up a grade of 75 feet rise per mile; hence it is planned for considerable power. Inasmuch, also, as the superstructure of the road is of a rail weighing 75 lbs. per yard, upon sleepers only 18 inches between centres, it has been determined to place the entire weight of the engine on but six wheels. The dimensions are, therefore, as follows:

Cylinders 20 inches diameter; 24 inches stroke; six drivers, 48 inches in diameter; wheels 12 feet between extreme centres; centres of cylinders (across engine) 8 feet 2 inches apart; boiler 51 inches interior diameter, containing 109 tubes, 3 inches in diameter, and 16 feet long; furnace 4 feet long, 9 feet 6 inches wide, 3 feet 10 inches deep at centre, 12 inches deep at sides; steam ports 14 by 1¾ inches; valves of my improved kind, giving a double admission and a double exhaust of steam. Whole weight of engine in running order, estimated at 70,000 lbs.

I am induced to hope, from the adoption of a form of boiler such as I have described, for improved results in burning anthracite coal. By my arrangement, the whole fire is under the reach of the fireman's shovel, while the entire surface of the grate is nearer the tube openings than by any other plan. Every one engaged in constructing locomotives, will admit that there has been a greater tendency, and, indeed, a greater opportunity, to increase the tube surface than the grate area of locomotive boilers. The difficulty of burning coal upon a small grate has led to its enlargement by longitudinal extension, so that grates of seven feet length are now quite common upon locomotives burning coal. The width

* Republished *Mech. Mag.*, vol. lx., pp. 201 and 241.

of such grates is, however, but three and a half feet, and there is no chance for firing, except on the top, through which the coal is *dumped* in a stack upon the grate. It is very difficult to keep the grates free from cinder, where they are of such length, and consequently they are more apt to become burnt out.

I should propose that in all locomotive boilers, the lower and side tubes be from one-quarter to one-half inch larger than the others. The draft is strongest at the centre and top of the body of tubes; hence, if the outer and lower tubes are of greater size than the others, more heat will be taken up in them, as the draft will be made easier.

I find that a reaction in regard to the size of tubes is going on in locomotive building. All of the most successful builders are adopting 2 inch, and in some case 2¼, and even 2½ inch tubes, in place of 1¾ inch tubes, which have been generally used for some years past. Even with a diminished surface, consequent upon increased diameter, the ability of the boiler to make steam under a given strength of blast, is found to be increased. The grounds upon which this increase has been made, were amply stated in the Journal for March.—*Journal of the Franklin Institute.*

## ON THE RESISTANCE OF HYDRAULIC LIME AND CEMENT TO THE ACTION OF SEA WATER.

BY MM. MALAGUTI AND DUROCHER.

For some years past the attention of learned men and builders has been occupied by the destructive action which sea water exerts on hydraulic mortar. In endeavouring to explain this disastrous phenomenon, M. Vicat has shown that sea water acts by its tendency to dissolve the lime of the mortar, which is then replaced by magnesia; but hitherto no one has indicated any efficacious means of preventing or neutralising this dissolving influence; we only know that in general the most powerful hydraulic mortars, the cements or mixtures of lime and pouzzolanes which adhere the most rapidly, are those which appear to resist best the causes of decomposition. Nevertheless, even among the cements of an equally rapid adherence and of nearly equal strength, there are some which possess very different powers of resistance, without our being able *à priori*, or by analysis, or a short trial, to ascertain in which we can place entire confidence.

Amongst these uncertainties, M. Durocher and I thought, that by studying those cements which resist the decomposing influence of sea water, conjointly with the analysis of those hydraulic limes and cements which do not present that resistance, as well as the products of the decomposition, we might hope to throw some light on a question whose difficulty equals its importance.

The samples, to the number of sixteen, on which we have experimented are, the hydraulic limes of Paviers and Doué, the mortars composed from them, Boulogne, Portland, Pouilly, Vassy, and Parker's cements; we are indebted for them to MM. Jebuvier, Watier, and Bellanger, to whom we return many thanks.

The course which we have followed in our investigations consists in examining the modifications in the proportions of the various elements, by comparing the composition of the products immersed in sea-water with that of similar substances which have not been plunged in it; but as we had no samples of lime and sand mortars which had been hardened in soft-water, to compare them with those which had been immersed in sea-water, the examination of these latter could only be made by comparing their composition with that of the lime used in their fabrication. In these comparisons we have been obliged to abstract the sand, and bring the composition of the mortars to what it would have been had there been no sand in them. We cannot give all the results to which our analysis have led us, and which are given in full in our Memoir; we only mention the most important ones, which will show how complicated these phenomena of decomposition are.

Two cylinders of Paviers' hydraulic lime were immersed in sea-water for eighteen months in precisely similar conditions. One had lost an enormous quantity of lime, and had gained a very little magnesia; but, on the other hand, it had fixed a quantity of carbonic acid, almost equivalent to the two earthy bases. As for silicic acid, a considerable portion had been removed, and a little alumina. It would appear that a hydrosilicate of alumina had separated from the mortar at the same time as the lime, whilst carbonic acid had replaced the elements which had disappeared. The alteration of the other cylinder was much less considerable; the loss in lime, and the gain in carbonic acid, had been less; but the quantity of magnesia substituted for lime was twice as great, and the loss of silicate of alumina was rather less. An analogous fact was repeated with a mortar made with this same Paviers' hydraulic lime.

Two prisms of this mortar were immersed for eighteen months in sea water. One of the two prisms was but little affected, whereas the other was found in a very ad-

vanced state of decomposition. However, in the prism which was the least altered, we proved that the lime had been eliminated, that a large proportion of carbonic acid had been fixed, and that the proportions of magnesia, silica, and alumina, had undergone but little change. The prism whose alteration was far advanced, had undergone a complete transformation in its composition. A considerable quantity of lime had been replaced by an atomically larger proportion of magnesia, and the carbonic acid had not changed perceptibly: the silicic acid and alumina had augmented considerably.

To explain these very different results, can we assert the non-homogeneousness of the hydraulic lime which was used in these experiments? We must mention that in the quarries of Paviers the various strata of hydraulic lime have not the same composition. The alteration undergone by the mortar produced by Doué lime is explained by a considerable loss of lime without any substitution of magnesia, and by the fixing of a large quantity of carbonic acid.

As for the alteration of cement, Boulogne cement, previously hardened in fresh water, began to crack after having been immersed for eight months in sea water; still its chemical composition had undergone no perceptible change.

It was very different with Portland cement, which, under the action of sea water, cracked, fixed almost as much carbonic acid as it originally contained, and finally lost a little lime, which was replaced by a small quantity of magnesia. Finally, a mortar prepared with 1 vol. of Portland cement, and 2 vols. of quartz sand, after being immersed in sea water for a year, presented no alteration, except that of having become richer in carbonic acid.

To sum up, the facts which we have now mentioned, and those detailed in our Memoir, show that the decomposition of lime cements and mortars by sea water do not always take place in the same manner; the substitution of magnesia for lime often takes place, but not always; and, as it is accompanied by the addition of carbonic acid, the altered mortar presents the re-union of a *hydrosilicate of alumina* and of a *double carbonate* which approaches the composition of *dolomite*. But there are cases in which the lime disappears without the introduction of magnesia, and then phenomena appear to take place as if it were in a water which contained no salt, but which was charged with carbonic acid. Moreover, in the alteration of moderately hydraulic mortars, the elements of the mortar are divided into two compounds, one rich in earthly carbonates, the other rich in alumina, forming, on the surface, a snowy deposit, which the waves remove. This division does not take place, or, at least, it is produced very slowly in very hard cements and mortars which adhere rapidly. The alteration manifested by these latter consists simply in the mass cracking, and the disappearance of a small quantity of lime, with or without being replaced by magnesia, and in either case it tends to produce an elimination of volume, wherein results the cracking of the mass.

We have still to speak of the cements which are considered as best resisting the action of sea water. Hitherto the cements of Pouilly, Vassy, and Parker, have passed for the most stable. One circumstance struck us during the analysis of these three cements: they are very rich in oxide of iron, and that of Parker, which resists the best, contains the greatest quantity. We found about 7 per cent. of oxide of iron in the cements of Pouilly and Vassy, and very nearly 14 per cent. in that of Parker. This led us to ask whether the presence of oxide of iron does not contribute largely to give those cements the property of resisting the decomposing influence of sea-water. To justify this idea, it was necessary to execute experimental investigations, by making ferruginous mortars, and exposing them to the action of sea-water; but it was necessary first to ascertain whether the oxide of iron contained in cements and mortars does not behave like an inert matter. Thus we had to investigate to what point this oxide is susceptible of forming, by the hurried way, combinations with lime. For this purpose we formed a species of ponzyolane of mixtures of silica and a little lime with alumina and oxide of iron; then we studied the action of lime-water on these mixtures previously heated to dull redness. After having been immersed for some time, these substances had augmented in volume, and showed the most remarkable characteristics. Each of them had divided into two distinct compounds; one had sunk to the bottom of the vessel, and had contracted very considerable cohesion and adherence; whereas, the other had assumed a flocky aspect, and, swelling more and more, had raised itself 15 or 16 centimetres from the bottom. On analysing the different compounds, we found that the quantity of lime precipitated is independent of the presence of alumina, whereas it is augmented by the presence of oxide of iron; moreover, we found that the flocky compound was the richest in alumina, and the concreted deposit contained most oxide of iron.

The activity of the oxide of iron in hydraulic materials appearing demonstrated by these synthetical experiments, we thought that we might conclude that the presence of

this oxide contributes to give stability to morters and cement immersed in sea water. It is true that we still have to prove whether cements or artificial hydraulic limes, formed by the admixture of lime with ferruginous argil, or mixtures of argil and hydrated oxide of iron, or again mixtures of argil and substances capable of engendering oxide of iron, are unattackable by sea water. But these experiments require a great deal of time, and we have thought it best to make known the results which we have already obtained, because they may be useful to builders of hydraulic works; and, moreover, because we much wish that they should be practically verified. Whatever the future may prove with respect to our inferences, the following facts are distinctly proved:

1st. The cements, which are considered as offering the most resistance to the destructive action of sea water, always contain notable quantities of oxide of iron.

2nd. Certain combinations of silica, alumina, and lime, give, *ceteris paribus*, very different reactions, according to whether they contain much, or are free from, oxide of iron.—*Chemist.*

## ON BOILER EXPLOSIONS.

*To the Editor of the Mechanics' Magazine.*

Sir,—The remarks I made on the cause of boiler explosions, and for which you were kind enough to find space in your valuable Journal of August 26th, contain a slight error as they stand in the following passage: "When the water gets too HOT, and the plate," &c., it should read, "When the water gets too low," &c. It is well known that boiler explosions generally occur previous to the starting of the engine, either in the morning, or after any of the ordinary stoppages during the day. The reason for this will be obvious when we consider that boilers are usually fed by a pump worked by the engine; the consequence is, that there is no feed water supplied until the engine is started, before which time the water above the flues or tubes is considerably reduced by evaporation. A column of cold water now being forced into the boiler, and coming in contact with the over-heated plates causes a rapid generation of steam above what the capacity of the cylinder requires; and this being retained in the boiler, rises to such a pressure in almost an instant of time, that unless the boiler be sufficiently strong, and the area of the safety-valves large, an explosion must ensue. The boiler must be very defective when such takes place during the working of the engine.

I have thus ventured again to draw attention to this important subject, feeling confident that unless some improvements be made, we shall have to record before long another sacrifice of life, perhaps from such cause.

I was not aware that Mr. Nasmyth had registered a safety-valve such as I described.

I am Sir, yours, &c.,

ENGINEER.

Manchester, Sept. 5, 1854.

## ELECTRIC TELEGRAPH WIRES.

*To the Editor of the Mechanics' Magazine.*

Sir,—There is, I believe, a considerable portion of battery power rendered unavailable in the transmission of the currents along the wires of electric telegraphs, in consequence of the inferior conducting power of the iron wires employed.

I am not aware whether the following plan has ever been adopted, but I think it might be with great advantage. It has occurred to me that this loss of power would be in a great measure avoided by electro-plating the iron wires with copper, by means of which their conducting power would be increased sevenfold. To prevent corrosion, they might be afterwards washed over with a solution of gutta percha, or some protecting varnish, which would also have the effect of more perfectly insulating them. I do not think the expense of this process would form any great objection when the saving of battery power is taken into consideration.

If you think there is anything advantageous in my suggestion, perhaps its insertion in your Magazine may be useful to those interested in the subject.

I am, Sir, yours, &c.,

R. H. STONE.

Camden Town, Sept. 7, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

HINCHCLIFFE, JOSEPH, junior, of Dam Side, near Halifax, York, cotton spinner. *Certain improvements in metallic pistons for tightening or adjusting the packing of the same, and also improvements in the construction of such pistons.* (A communication.) Patent dated February 17, 1854. (No. 385.)

This invention consists in an arrangement by which packing-rings may be effectually tightened or adjusted in the cylinder by means of a follower operating between the two flanges of the piston, the follower being attached to a rod passing down through a hollow piston-rod.

HOLT, ROBERT, of Shaw, near Oldham, Lancaster, engineer. *Certain improvements in machinery or apparatus for manufacturing bricks and tiles.* Patent dated February 17, 1854. (No. 386.)

In carrying out this invention, the clay is delivered from the "pug mill" and conveyed into or over the periphery of a drum, which is provided with a number of hollows or moulds of the size and shape of the brick or tile required, and a presser or piston is then caused to descend upon it.

ROWLAND, ELLIS, and JAMES ROWLAND, of Wakefield-street, Manchester. *Improvements in clearing the tubular flues of steam boilers.* Patent dated February 17, 1854. (No. 387.)

This invention consists in blowing steam through the flues.

POOLE, MOSES, of Avenue-road, Regent's park, Middlesex. *Improvements in boiler-furnaces and other furnaces.* (A communication.) Patent dated February 17, 1854. (No. 388.)

This invention consists in the use of regulating-dampers placed on or near the tops of what are commonly called flame or check bridges, "by means of which dampers the regulation of the draft of the furnace and the better distribution of the flame and hot products of combustion are rendered easy."

MORRISON, WILLIAM, of Bowling, Dumbarton, North Britain, engineer. *Improvements in railway wheels.* Patent dated February 18, 1854. (No. 390.)

This invention consists in forming cast-iron railway wheels each in one solid piece, with a disc corrugated concentrically instead of spokes. The disc, the tyre, and the nave, or boss, are all cast in one piece, and the corrugations are concentric with the nave of the wheel.

WELLS, BENJAMIN WESTON, of Windmill-lane, Camberwell, Surrey, floor-cloth manufacturer. *Improvements in printing floor and other cloths.* Patent dated February 18, 1854. (No. 392.)

These improvements consist in imparting pressure to the printed pattern of floor and other cloths while the colours are in a moist state by means of blocks containing a counterpart in colours of the printed pattern, "whereby solid work is obtained, and the necessity for a double set of pattern blocks, and consequently double printing from pattern blocks is avoided."

LOYSEL, EDWARD, of Rue de Grétry, Paris, France, civil engineer. *Improvements in apparatus for obtaining infusions or extracts from various substances.* Patent dated February 18, 1854. (No. 393.)

*Claim.*—Constructing apparatus for obtaining infusions or extracts so that the water or other liquid employed may, by hydrostatic pressure, be caused first to pass upwards through the pulverized material intended to be operated upon, and after maceration be caused to descend through the material, and then extract or carry off the soluble or extractive matters contained in it.

BRITTEN, BASHLEY, of Anerley, Surrey, gentleman. *Improvements in crushing, pulverizing, and washing mineral earths or ores, and amalgamating the gold and silver contained therein, which said improvements are also applicable to crushing and pulverizing other substances.* Patent dated February 18, 1854. (No. 394.)

The inventor describes an apparatus which consists of a circular basin having a sunken circular space at the bottom with a raised centre, and of a crusher or pestle, in shape resembling a pear, with the smaller end downwards. This crusher revolves in the basin, pressing against its side, and having also a sliding motion caused by the small end of the crusher.

RIGGENBACH, NICHOLAS, of Basle, in Switzerland, engineer. *Apparatus for preventing incrustation in steam-boilers.* Patent dated February 20, 1854. (No. 396.)

The inventor produces currents in the water contained in boilers by means of partitions composed of plates of sheet-iron placed horizontally across the boiler and inserted between pieces of angle iron. He prefers placing one of these plates about an inch below the lowest water-level, and the other so that it about equally divides the body of the water.

BARLOW, WILLIAM HENRY, of Derby, civil engineer. *Improvements in securing and connecting the rails of railways.* Patent dated February 20, 1854. (No. 397.)

*Claim.*—Securing and connecting the rails of railways by means of a chair or trough in conjunction with two wedges and a bolt; or by means of a chain or trough in conjunction with a wedge and a tapered bolt.

CHISHOLM, JOHN, of Holloway, Middlesex, chemist. *Improvements in the puri-*

*fication of gas.* Patent dated February 20, 1854. (No. 401.)

*Claims.*—1. The use in purifying gas of the silicious earthy matter, containing oxides of iron and of manganese, found under bogs and alluvial deposits. 2. Of ferruginous gravel which overlies and is intermingled with chalk formations. 3. Of ferruginous clay or loam of the alluvial formation. 4. Of the phosphate and superphosphate of lime of the tertiary formation.

BEALL, JAMES, of Effingham-place, Cheshunt, Herts. *Improvements in apparatus for suspending looking-glasses in frames.* Patent dated February 20, 1854. (No. 402.)

*Claim.* "Suspending looking-glasses in frames by means of axes passing from side to side."

HILLIARD, HARVEY, of Glasgow, Lanark, North Britain, of the firm of Hilliard and Chapman, cutlers. *Improvements in apparatus for cleaning and sharpening table cutlery.* Patent dated February 20, 1854. (No. 403.)

This invention consists of various modifications of existing cutlery cleaning apparatus, wherein the drum or containing-box and polishing discs are made entirely or chiefly of cast-metal, to avoid the usual tendency to warp and get out of shape.

TOWERS, THOMAS, of Salford, Lancaster, gentleman. *Certain improvements in marking boards used in connection with billiard and bagatelle tables, for registering and indicating the number of games played.* Patent dated February 20, 1854. (No. 404.)

These improvements consist in registering within a framework the gradual advance of the games mentioned, by means of separate numerals and quarters of hundreds or other proportional numbers simultaneously, as well as registering at the same time the gross number played up to any given period.

MILNER, WILLIAM, of Liverpool, Lancaster, fire-proof safe manufacturer. *Certain improvements in locks for safes, which said improvements are applicable to locks in general.* Patent dated February 20, 1854. (No. 405.)

This invention consists in filling up all the open spaces usually left around the tumblers and other working parts of locks, leaving only sufficient space for the turning of the key, the slight lift of the tumblers, and the limited action of the springs, &c., thus substituting for what has commonly been the box of the lock an almost solid block of metal.

URIE, JOHN, of Glasgow, Lanark, photographic artist. *Improvements in photographic pictures.* Patent dated February 20, 1854. (No. 407.)

The inventor claims a mode of colouring or tinting the backs of photographic pictures on glass or other transparent material, and a mode of producing in them an appearance of relief by placing a black opaque or other back-ground on the back of the plate.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WRIGHT, WILLIAM, of Wolverhampton, Stafford, gardener. *Improvements in ornamenting walls and other similar surfaces.* Application dated February 17, 1854. (No. 382.)

Having painted the surface to be ornamented with a ground colour, the inventor takes a metal mould, the section of which is of the form of design required; such, for instance, as a leaf or flower, and charges this mould with putty. "The paint of any colour that may be desired being prepared in any suitable form, the bottom of the mould is covered with the paint, either by immersion or any convenient method; the bottom of the mould is then applied to the surface to be decorated, and being instantly removed, leaves the form of design represented by the section of the mould printed on the wall."

WETHERED, GEORGE, of Maidenhead, Berks, coal merchant. *Improvements in machinery or apparatus for shaking straw.* Application dated February 17, 1854. (No. 384.)

This invention consists in arranging a series of bars or shafts, having a perforated plate or strips of wood, or wire gauze of a peculiar form, attached to them.

HARRIS, PETER GEORGE, of Buckingham-street, Adelphi, Middlesex, engineer. *Improvements in locomotive engines.* (A communication.) Application dated February 18, 1854. (No. 389.)

The inventor describes an arrangement of parts intended to transfer additional weight to the driving wheels, and to ease the locomotive round sharp curves.

NESBIT, JOHN COLLIS, of the Chemical and Agricultural College, Lower Kennington-lane, Surrey. *Improvements in the manufacture of manure.* Application dated February 18, 1854. (No. 391.)

These improvements consist in dissolving in sulphuric acid, by means of heat, free steam, being prepared for the purpose, leather, leather scrapings, or fragments of leather, for the purpose of forming manure; and also in combining the solution thus made with bones, coprolites, and other similar substances.

HILL, JOHN REED, engineer, of Princes-street, Stamford-street, Lambeth. *Improvements in machinery for pulverizing metallic ores, or other similar hard substances.* Application dated Feb. 20, 1854. (No. 395.)

This invention consists in the use of two or more conical-shaped runners or crushing wheels placed with their smaller ends outward, and revolving on a circular horizontal bed plate, having an inclined depression to fit the runners.

ASPINALL, JOHN, of King William-street, London, engineer. *An improvement in machinery employed in the manufacture of sugar.* Application dated February 20, 1854. (No. 398.)

The object of this improvement is to prevent clogging or obstruction in that description of machinery for separating molasses from sugar by exhaustion, wherein the sugar is operated on while passing between two concentric wire-gauze screens of a cylindrical or conical form. This is attained by fitting a screw-thread or threads to the interior of the outer screen, whereby the sugar is not only caused to advance, but the inner wire-gauze screen is also kept clean and in a condition for a lengthened continuance of work.

PREVET, RENÉ CHARLES JULES, of Paris, France, gentleman. *Improvements in treating textile plants for obtaining pulp for manufacturing paper.* Application dated February 20, 1854. (No. 399.)

For separating the fibre of plants the inventor employs American potash, salts of soda, lime, and sulphuric acid, and for bleaching it he makes use of nitric and muriatic acids, chloride of lime, oxide of manganese, alum, carbonate of soda, and sulphurous oxide. The mechanical apparatus used for treating them and making the pulp consists of vats placed to receive the steam, cylindrical hammers conveniently arranged for opening, bruising, and crushing the fibres, and vats for bleaching them.

GRAY, THOMAS, of St. Clement's-lane, Strand, London. *Improvements in the manufacture of pulp from wood.* Application dated February 20, 1854. (No. 400.)

The machine the inventor proposes to use for reducing the wood to the finely divided state required consists mainly of a circular revolving metal plate, one surface of which is corrugated, or has formed on it projecting teeth, somewhat similar to those of a rasp.

MELVILLE, WILLIAM, of Roebank-works, Lochwinnock, Renfrew, printer. *Improvements in printing textile fabrics and other surfaces.* Application dated February 20, 1854. (No. 406.)

According to one branch of these improvements the fabric to be printed is stretched upon a flat table or impressing surface, so contrived as to dispense with the usual angle or meter cuts for producing the necessary blanks at the corners, the parts of the table where the fabric is not to be printed being suitably bevelled, recessed, or sloped off.

## PROVISIONAL PROTECTIONS.

*Dated June* 20, 1854.

1349. Robert Reeves, of Bratton Westbury, Wilts. Improvements in drills for drilling liquid manure.

*Dated July* 5, 1854.

1477. Thomas Grubb, of Dublin, civil engineer. Improvements in microscopes.

*Dated July* 6, 1854.

1485. William Neuzam Nicholson, of Newark, Nottingham, ironfounder and agricultural-implement manufacturer. Improvements in hay-making machines, part of which improvements is applicable to carriages generally.

1490. Nicholas Michael Caralli, of Glasgow, Lanark, merchant. Improvements in the manufacture or production of ornamental fabrics.

*Dated July* 18, 1854.

1575. Charles Maybury Archer, gentleman of the press, of St. James's gardens, Haverstock-hill, Middlesex. Treating all kinds of paper whereon any printing, engraving, engrossing, letter-writing, or lithographing has been printed or impressed, so that the said printing, engraving, engrossing, letter-writing, or lithographing may be completely removed, discharged, or obliterated from the said paper, and so that the said paper may be readily re-used in sheets or be reconverted and worked up again into its primitive pulp by the ordinary method, and be again manufactured into and be used as paper.

*Dated July* 24, 1854.

1623. Auguste Castets, manufacturer, of Paris, France. The extraction of a substance for supplying the place of quinine.

*Dated July* 26, 1854.

1647. William Littell Tizard, of Aldgate, London, engineer. Improvements in fermentation, and in apparatus employed therein.

1648. Pierre Victor Delaye, of Paris, France. Improvements in printing-blocks.

*Dated July* 28, 1854.

1664. Robert Henry Thompson, of Old Charlton, Kent, engineer. A universal self-acting sawing-machine.

*Dated July* 29, 1854.

1679. Auguste Edouard Loradoux Bellford, of Castle-street, London. An improved method of engraving. A communication.

*Dated August* 8, 1854.

1739. Alexander Ogg, of Glasgow, Lanark, shoemaker. A new composition, applicable to the cementing of leather.

*Dated August* 9, 1854.

1749. John Hackett, of Derby, manufacturer. Improvements in the manufacture of garments or of parts of garments, or of appendages or appliances to garments.

*Dated August* 10, 1854.

1750. William Houghton Clabburn, manufacturer, of Pitt-street, Norwich. Improvements in the manufacture of shawls and scarfs.

*Dated August* 11, 1854.

1752. Edward Monson, of Birmingham, War-

wick, daguerreotype artist. New or improved machinery for manufacturing, cleaning, and polishing daguerreotype plates.

1754. Joseph Reimann, of Breslaw, Prussia, and Friedrich Sauermann, of the same place. Improvements in fire-arms.

*Dated August 12, 1854.*

1760. John Gibson, of Paddington, Middlesex, engineer. Improvements in the manufacture of railway wheels.

1762. William Woodcock, of the Earl's-court Brewery, Brompton, Middlesex. An improvement in the combustion of fuel.

1764. George Weston, of Sheffield, York, cabinet-maker. An improved veneering-apparatus.

1766. John Petrie, junior, of Rochdale, Lancaster, ironmonger. Improvements in machinery or apparatus for drying wool.

*Dated August 14, 1854.*

1768. Henri Louis Edmond Désiré Hennebutte, of Esquermes lez Lille Nord, France. Improvements in the manufacture of varnishes.

1770. Peter Haworth, of Manchester, Lancaster, currier and leather-dealer. An improved belt, band, or strap-fastener.

1772. William Crosland, of Hulme, Lancaster, engineer. Certain improvements in machinery or apparatus for governing or regulating the speed of steam engines, or other motive-power engines.

1774. Joseph Beardmore, junior, of Stowage, Deptford, Kent. Improvements in supplying air to furnaces.

*Dated August 15, 1854.*

1776. Benjamin O'Neale Stratford, Earl of Aldborough, of Stratford-lodge, Wicklow, Ireland. Improvements in projectiles.

1778. John Withers Taylor and Charles Jackson Taylor, of Nottingham, manufacturers. The employment of adhesive imitation embroidery to lace, muslin, silk, woollen, cotton or other fabrics, such embroidery being formed of cut, pressed, or stamped patterns of velvet, crape, or other materials.

*Dated August 16, 1854.*

1780. John Coupland, of Southampton, newspaper proprietor. The preparation and manufacture of a pulp to supersede the use of rags and similar fabrics in the manufacture of paper.

1784. Francis Higginson, of King William-street, London, Esq. Effecting certain improvements in the mode of laying, directing, and aiming with ordnance, ship, garrison, and battering guns, and field-pieces of every description.

1786. Robert Carr, chemist, Shrewsbury-road, and William Crossby, miller, Division-street, both of Sheffield, York. Burning or consuming smoke in furnaces and fires for engine boilers.

1790. John Lamb and Thomas Lamb, both of Kidderminster, Worcester, machinists. Improvements in Jacquard machinery, and in the apparatus connected therewith.

1792. Thomas Wallworth, of Manchester, Lancaster, British gum-manufacturer. Improvements in purifying and treating grain, and in dressing flour, and in machinery for these purposes.

1794. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in windlasses. A communication.

*Dated August 17, 1854.*

1796. John Turner Wright, of Birmingham, Warwick, manufacturer, and Edwin Payton Wright, of Birmingham, manufacturer. An improvement or improvements in the manufacture of ropes, cords, lines, and twines.

1798. Charles Blake, of St. Leonard's, Sussex, painter. An improvement in or addition to doors, and door and window-frames.

1800. Julian Bernard, of Club-chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots and shoes, or other coverings for the feet.

*Dated August 18, 1854.*

1802. Sara Spaldin, of Hull, Yorkshire, spinster. Improvements in apparatus for preventing loss of life at sea.

1804. William Baker, of Birmingham, Warwick, clock and clockcase-manufacturer. A new or improved method of manufacturing the bezils or rings used in glazing the dials of clocks and barometers, and for other like purposes.

1806. John Reed Hill, of Princes-street, Stamford-street, Lambeth, civil engineer. Improvements in machinery for pulverizing metallic ores or other similar hard substances.

1808. Thomas Webster Rammell, of Trafalgar-square, Middlesex. Improvements in stoves and fireplaces.

1810. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Certain improvements in direct-acting marine engines. A communication.

1812. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in preserving corn and other dry seed. A communication.

1814. William Ker and Matthew Ker, both of Tottenham-court-road, Middlesex, cabinet-makers. An improvement in the frames of expanding tables.

1816. Samuel Kershaw, of Heywood, Lancaster, manufacturer, and James Taylor, of the same place, manager. Certain improvements in carding-engines.

1818. François Mathieu, of Bartlett's-buildings, Holborn, Middlesex, gentleman. Improvements in filters.

1820. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the manufacture of hat-bodies. A communication.

*Dated August 19, 1854.*

1822. Charles O'Neill, of Liverpool, Lancaster, joiner. Improvements in the mode or method of fitting-up or fixing the berths in emigrant ships or other vessels.

1824. Joseph Barrows, of Handsworth, Stafford, wine-merchant. A new or improved instrument to be used in cutting loaves of bread and other articles of food.

1826. James Hodgson, of Sweeting-street, Liverpool. Improvements in the construction of iron vessels.

1828. George Thomas Smartt, gentleman, of Doncaster, York. Economizing the use of grease, oil, or other lubricating articles in axle-boxes.

1830. William Vitruvius Greenwood and John Saxby, of Brighton, engineers. Improvements in signal-lamps.

*Dated August 21, 1854.*

1834. Thomas Miller, of Fairfield-place, Stepney, Middlesex. Improvements in apparatus for raising coals and other weights from the holds of ships and other places.

1836. Stopford Thomas Jones, of Union-court, Old Broad-street, London. Further improvements to reduce and wash minerals to extract metal therefrom, especially gold.

1838. Robert Barlow Cooley, of High-street, Nottingham, and of Mercer's-row, Northampton, hatter and glover. An improvement in gloves.

*Dated August 22, 1854.*

1840. Augustin Jacquelain, professor of chemistry, in Paris, France. Certain improvements in the manufacture of gas for illumination and heat.

1842. William Hunter Meriwether, of Morley's Hotel, Strand, Middlesex. Improvements in the construction of fences and hurdles.

1844. John Buchanan, of Leamington Priors. Improvements in marine engines.

1846. James Lamb Hancock, of Milford Haven, Pembrokeshire. An improved pneumatic safety-inkstand.

1848. Charles Blunt, of Sydenham, Kent, gentleman, and Joseph John William Watson, of Wandsworth, doctor of philosophy. An improved description of artificial fuel.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1850. Theodore Schwann, of Neuss, Prussia, doctor in medicine. Improvements in machinery or apparatus worked or actuated by helicals or spirals. August 23, 1854.

1894. Pierre Amable de Saint Simon Sicard, of Paris, chemist. Improvements in apparatus for raising and destroying submerged vessels, rocks, and other bodies, and also in apparatus to facilitate the examination of submerged bodies. August 29, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 5th,* 1854.)

950. John Goucher. Improvements in propelling ships and other vessels.

952. Edward Crosland and Thomas Boardman. Improvements in weaving, and in machinery for manufacturing cut pile and other fabrics.

953. Thomas Griffith Owen. An improved construction of portable filter.

956. John Henry Johnson. Improvements in polishing and flattening metal plates. A communication from Henry Beaud, of Paris, France, manufacturer.

958. Henry Clarke. Improvements in fire-arms and ordnance.

966. Alexander Mills Dix. Improvements in apparatus for regulating or governing the supply or pressure of gas as it is conducted from the main to the burners.

971. Edwards Briggs and William Souter. Improvements in treating and preparing silk, and in machinery connected therewith.

973. William Augustus Archibald. Improvements in the manufacture of concrete cane-juice and sugar.

980. William Hutton. An improved machine for the manufacture of bricks.

981. Joe Mayer and John David Kind. An improvement or improvements in attaching door-plates, letters and figures made of glass, porcelain, earthenware, or other vitreous, or semi-vitreous substance to doors, and such other surfaces as the same may be required to be attached to.

985. Carlo Minasi. Improvements in apparatus for hatching eggs, and for raising or rearing the young when first produced.

989. Leon Glukman. Improvements in effecting electric communications in railway trains and vessels.

1007. Adrien Georges Amant Martin and Casimir Lefol. Certain improvements in the manufacture of iron wheels.

1010. Arthur Warner. Improvements in the manufacture of metal sheets for sheathing ships and other vessels, and for other uses.

1024. Julian Bernard. Improvements in machinery or apparatus for sewing, stitching, or ornamenting.

1041. James Ward Hoby and John Milner. Certain improvements in steam engines.

1050. John Cundy. An improved reflector globe or shade for gas, candle, oil, and other artificial light.

1072. Eugene Barsanti and Felix Matteucci. A new or improved mode of applying the explosion of gases as a motive power.

1144. Frederick Jenks and Thomas Brown. An improvement or improvements in saddle-trees.

1210. Léon Isidore Molinos and Charles Pronnier. Improvements in locomotive steam engines.

1353. William Edward Newton. An improved manufacture of pigments or colouring matters. A communication.

1363. William Stableford. Improvements in railway breaks.

1401. Reuben Bottomley, David Schofield, and Henry Spencer. Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.

1490. Nicholas Michael Caralli. Improvements in the manufacture or production of ornamental fabrics.

1540. Edwin Travis. Certain improvements in machinery or apparatus for indicating and registering the height of water, and also the pressure of steam in steam boilers or generators.

1547. Charles Sewell. An improvement in spring hinges for doors and gates.

1566. Thomas Mayos Woodyatt. An improvement or improvements in consuming or suppressing the smoke of steam engine boiler and other furnaces.

1623. Auguste Castets. The extraction of a substance for supplying the place of quinine.

1667. Amable Hippolyte Petit. An improved mode of joining pipes.

1697. John Simon Holland. Improvements in locks.

1699. Samuel Lees. Improvements in machinery or apparatus to be used in purifying gas for illumination.

1706. Charles Tetley. Improvements in rotatory engines to be worked by steam or water.

1739. Alexander Ogg. A new composition, applicable to the cementing of leather.

1747. John Lucas. Improved machinery for pulping or reducing vegetable substances.

1765. John Benjamin Daines. An improved mode of treating surfaces of stone, plaster, and cement, for the preservation of the same from decay.

1769. Joseph Moore, Samuel Beswick, and Benjamin Wilson. Certain improvements in the manufacture of piled goods or fabrics.

1774. Joseph Beardmore, junior. Improvements in supplying air to furnaces.

1780. John Coupland. The preparation and manufacture of a pulp to supersede the use of rags and similar fabrics in the manufacture of paper.

1787. William Kennard. Improvements in attaching door or other knobs and handles.

1802. Sara Spaldin. Improvements in apparatus for preventing loss of life at sea.

1816. Samuel Kershaw and James Taylor. Certain improvements in carding engines.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed September* 1, 1854.

524. William Vaughan and John Scattergood.

527. Charles de Bergue.
562. James Smith.
584. Zephirin Bôitteux.
586. John Patterson.
658. Claude Adrien Bernard Chenot.
660. John Longbottom.
676. Thomas Simons Watson.
678. John Horsfall Robinson.
778. Henry Blatter.
1270. Thomas Richardson.
1448. John Kolbe Milne.
1460. Thomas Haimes.
1480. John Glasgow.
1520. William Eassie.

*Sealed September* 5, 1854.

567. William Young.
597. John Buchanan.
603. Edward Haeffely.
635. John Gerard.
665. William Stevens and William Stevens, junior.
771. Bernhard Samuelson.
877. Frederic Barnett.
1345. Alexander Stephen and Alexander Pirnie.
1391. Richard Garrett, junior.
1439. Thomas Slater and Joseph Tall.
1461. John M'Gaffin.
1465. Richard Garrett and Richard Garrett, junior.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.



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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., *Dublin; W. C. Campbell* and Co., Hamburg.

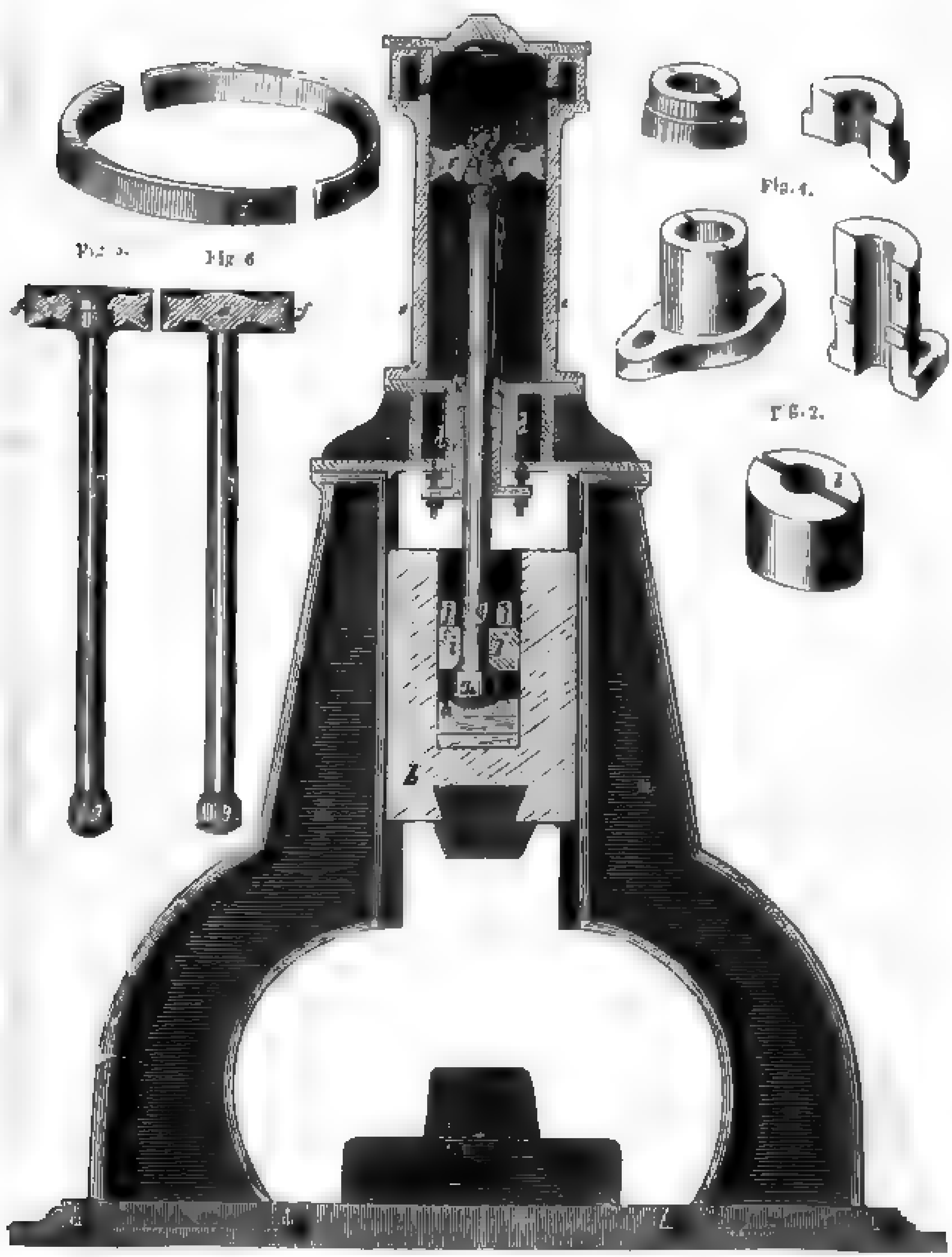
# Mechanics' Magazine.

No. 1623.] SATURDAY, SEPTEMBER 16, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## NASMYTH'S PATENT IMPROVED STEAM HAMMER.

Fig. 7. Fig. 1. Fig. 3.



## NASMYTH'S PATENT IMPROVED STEAM HAMMER.

(Patent dated October 22, 1853.)

Mr. Nasmyth, of Patricroft, to whom the engineering world is indebted for the steam hammer which bears his name, has effected some further improvements on that valuable machine, a description of which we now propose to lay before our readers. These improvements consist—

*Firstly.* In constructing the piston-rod glands of steam hammers and pile-drivers in two or more pieces, for the purpose of allowing the knob at the lower end of such piston-rod, or the projection to which the piston is secured, to pass through the hole in the cylinder bottom. *Secondly.* In improved modes of connecting pistons to the piston-rods of steam hammers and pile-drivers. *Thirdly.* In making the piston, piston-rod, and knob at the lower end thereof, in one piece; and, *Lastly.* In an improved packing ring for the pistons of steam hammers and pile-drivers.

Fig. 1 represents an elevation of a steam hammer to which the improvements are applied; *a* is the framing; *b* the hammer head or block; *c* the cylinder; and *d* the cylinder bottom. These parts are constructed in the usual manner. *e* is the piston, which may be packed according to any of the methods now in use, or with the improved packing ring, *f*, which will be explained hereafter. *g* is the piston-rod, to which the piston is attached, in the following manner:—The upper part of the piston-rod at $g^1$ is made considerably more in diameter than the body of the rod, and the space between $g^1$ and $g^2$ is turned conical. The upper end of the piston-rod, previous to riveting the piston on it, is cylindrical, as shown by dotted lines. The piston having been accurately bored out, is placed upon the conical part, between $g^1$ and $g^2$, and the upper end of the rod is then hammered until it fills up the space between $g$ and $g^2$; by this means the piston is so securely fastened to the piston-rod that no injurious effect is produced upon them by the violent concussive action to which these parts of steam hammers are subjected when at work; whereas when the piston is connected to the piston-rod by any of the usual methods, it frequently gets loose. At the lower extremity of the piston-rod is forged the knob, $g^4$, which bears upon the plate, *h*, and serves to connect the rod to the hammer head, as in steam hammers now in use. The packing ring, *i*, is tightened on the knob, $g^4$, by the wedge-keys, *j*; but as both extremities of the piston-rod are forged solid with the rod, and are more in diameter than the part on which the ring, *i*, fits, it is evident that this ring must be put together in two halves, as shown in the perspective view, fig. 2. For the same reason the stuffing-box gland ring, *k*, and gland, *l*, must also be put together in two parts, as shown in the perspective views, figs. 3 and 4. The gland, *l*, is furnished with a tenon or dowell, so that when the halves are clasped together around the piston-rod they act simultaneously, on being screwed up by the ordinary tightening screws. Fig. 5 is a detached view of a piston and piston-rod, showing another mode of fastening them together. Fig. 6 represents the piston and piston-rod forged together, as has been done before in steam hammers. Fig. 7 is a perspective view of the improved packing ring, *f*, for the pistons of steam hammers and pile-drivers. The packing ring is triangular in section, and may be cut in two, so as to be able to get it into the recess of the solid piston. The sharp angle of the triangle is placed downwards, so that the upward motion of the piston has a tendency to bring the packing ring against the interior of the cylinder, or into the proper position for forming a steam-tight joint, whereas when the piston descends, the friction of the ring against the interior of the cylinder draws the ring into a position which relieves the joint, and allows the piston to descend freely. The improvements are only shown and described as applied to a steam hammer, as their construction is the same when applied to pile-drivers.

## ON THE APPLICATION OF THE CENTRIFUGAL BLOWING MACHINE TO HIGH-FURNACES.

BY FREDERICK MARQUARDT.

An attempt has been made to apply the centrifugal blowing machine for smelting purposes in the high-furnaces of the Neuahütte in Azaska, in the Banat, near the Turkish frontier of Austria. The object of this paper is to record the results of the trials made, and to describe the construction of the apparatus.

The high-furnace here referred to has a diameter of 7 feet at the boshes, and is 33 feet high from the hearthstone to the tunnel-head. The hearth is 18½ inches at the bottom, and 29 inches at top; the crucible is 18½ inches to the tuyeres, and the whole height of the hearth 5 feet 8½ inches.

The ores employed for smelting consist of

compact magnetic ironstone, yielding 70 per cent. of raw iron; red and brown hematite, averaging 55 per cent.; and earthy iron ochre, and yellow hematite, averaging 30 per cent.; and, finally, ankerite, yielding 22 per cent. Some of these ores are extremely fusible, but difficult of reduction; and among them, the magnetic ores especially are so dense and compact, that they cannot be completely reduced without repeated roastings.

The fuel generally used consists of hard beech charcoal, of which the Austrian cubic foot (1·112 English cubic foot) weighs 12 about one-third of ordinary pit-coal, of Austrian pounds (14·8 English pounds); to this was added, with very satisfactory results, which 13 pounds is equivalent to one cubic foot of charcoal.

The two centrifugal blowing fans (one for present use, the other being kept in reserve) have each a diameter of $20\frac{3}{4}$ inches; the vanes are $6\frac{3}{4}$ inches long, those of one fan being $3\frac{5}{8}$ inches wide, and those of the other $4\frac{5}{8}$ inches. The wind openings are $9\frac{1}{4}$ inches in diameter, and placed somewhat eccentrically in the fan-case. The axle is of cast-steel, with a maximum diameter in the middle of $3\frac{1}{10}$ inches, the journals being only 18 lines. These are tempered to the hardness of glass, and finely polished. The gudgeons consist each of a single piece, carefully and exactly drilled, and composed of an alloy of 84 parts of copper to 16 of tin.

An exact and careful setting of the axle in its bearings is absolutely essential, and upon it chiefly depends the durability and effective working of the entire apparatus. The journals lie on the metal axle cushion only at both ends, so that a small space being left in the middle for the oil, the journals are, to a certain extent, surrounded by a layer of oil. To prevent the oil from running off, there are leather flaps, which are wedged into the gudgeon lining, and embrace lightly, but firmly, each of the journals. This simple contrivance prevents waste of oil, causes the journals to be always surmounted with the liquid, and prevents them from becoming heated.

A very important portion of the centrifugal blast machine is its system of vanes. These vanes should be capable of catching, in a continuous manner, the surrounding air, and then of pouring it towards the furnace with the velocity of its centrifugal motion. The vanes must therefore commence at the axle itself, with a regular curvature, and be very firmly and solidly fixed, so as to be free from shock or vibration; and, finally, they should be so exactly alike in size and weight, that when arranged upon the axle, with the journals placed horizontally, they should exactly balance each other in every position. The least imperfection in this respect, in consequence of the great velocity of rotation of the fan, would exercise a fatal effect upon the entire arrangement, and in a short time derange its stability.

In the arrangement here described, the vane-stock, with the four vanes, is cast out of malleable gun-metal. The vanes are curved on the axis towards the edges and circumference, and their surfaces are adjusted at right angles to the direction of motion. The vanes have at the shaft a thickness of six lines, at the circumference a thickness of three lines, and are strengthened in the middle by ribs six lines thick.

During the first trials the vanes were made much weaker, and a change in their dimensions was soon desirable. Several vanes were literally torn asunder by the centrifugal force, and their fragments flung far into the blast-pipes. Several different forms of vanes were also selected, straight and radiating, straight and not radiating, but deviating in the direction of the motion, and also deviating in the opposite direction, some divided by a disk in the middle. Among all of them, that which is here described was found most advantageous; and while the sound it makes is so slight as to be scarcely heard outside the works, others produced such a tremendously ear-splitting roar, that they could be heard, even by day, miles off, in the valley of the Nexa, and along the mountains.

When I add that the fan is fixed on a heavy iron plate, and arranged with a surrounding tin pan to collect any waste oil, and that the whole rests on a framework of strong and heavy beams, I trust its construction has been made sufficiently plain.

The centrifugal machine here described is driven by one of Fontaine's turbines, which works with a clear fall of $7\frac{1}{2}$ feet. A turbine must necessarily be selected under the circumstances, for the water comes directly out of a mountain stream, the Nexa, and flows back again after performing its duty; during floods the upper and lower waters rise several fathoms, and at such times any other hydraulic machine would be evidently unsuitable. The turbine makes 60 revolutions in a minute at its maximum speed, and transfers its action by two successive series of belts and multiplying wheels in a fifty-fold proportion of speed to the centrifugal machine. The fan consequently makes 3,000 revolutions per minute, which gives, at the circumference of its vanes, a velocity of 259 feet per second. The observed pressure on a sensitive water manometer placed in the blast-

pipes, is a fraction of this velocity, and agrees exactly with calculation.

With the aid of these apparatus and mechanical contrivances, I have been able to collect a mass of experimental facts and observations, of which I beg to submit the principal conclusions. These are given, first, in so far as they refer to the actual arrangements of the blowing machine, and then as to its special application to high furnaces. The following are the principal results alluded to:

1. The area of the orifice of the tuyere ought at most not to exceed half the surface of a vane.

2. In this case the air will rush out of the tuyere with nearly the circumferential velocity of the vanes, and the pressure shown by the manometer will be a fraction of that velocity.

3. If this maximum area be diminished, so may also the requisite driving power, while the original velocity may continue to be maintained. By uniformly-continued driving force the velocity of the vanes becomes continually accelerated, and the pressure exhibited by the manometer continues still a function of the increased velocity. If the area of the orifice should be reduced to zero, the resistances to the impelling force will be reduced to the friction of the machinery, and that of the air passing between the vanes and their framing.

4. If the orifice of the tuyere is greater than the above-mentioned maximum, the velocity of the blast will be proportioned to that of the circumference of the fan relation to their surfaces. Consequently, in order that a centrifugal blowing machine can perform the greatest effect with the smallest driving force, the area of the orifices of the tuyeres must be to that of one of the vanes in the proportion of 0·9 to 2·. Moreover, the maximum quantity of air which can be blown by a machine of given dimensions is very approximately deduced from the product of half the area of a vane, by the circumferential velocity.

The effective mechanical work of a blowing machine can be obtained only from a comparison of its maximum duty with the driving force required for that effect; and the effective mechanical work done appears, from experiment, to amount to 92 per cent. of the maximum duty.

Finally, with a given determinate quantity of air to be blown out from a machine, the surfaces of the vanes must be less in a certain proportion, according as the velocity with which the air is to be blown increases.

If this rule be applied to existing fan-blowing machines, it follows that almost all such machines (at least so far as I have seen) have entirely too large dimensions. that they are too weak for high pressures of wind, and lastly, when driven at the maximum of their blowing power, they would require a driving force far exceeding their power of endurance.

Such fans as are usually in connexion with cupola furnaces, mechanical workshops, &c., have generally vanes of from 103 to 107·3 square inches; these fans would be able, with a circumferential velocity of 259 feet per second, to deliver at the blast orifice the enormous volume of 5,103 cubic feet of air per minute; in other words, enough to supply three great charcoal high-furnaces, or five cupola-furnaces, with sufficient wind.

The continuous working of such blast-machines during fifteen months' experience has fully established the fact, that with charcoal high-furnaces the requisite strength of wind can be obtained. Without working the machines so as to rapidly wear them out, or to exercise a disturbing action on their parts, they maintained daily for several months a velocity of 4,000 revolutions per minute; in other words, a velocity of 342 feet per second at the circumference of each fan; and this took place without heating of the journals, or any perceptible wear and tear, except in the belts of the multiplying wheels, which could not completely resist the effects of such a high working speed. All remedies appear useless in this case; and even belts cut from the best American hides were insufficient, and became rapidly warped and cracked along their fibres.

The attempts made to discover the causes of this phenomenon unquestionably showed that there was no slipping of the straps on their pulleys, and consequently that no perceptible heating of the leather could result. It appears further, that the rapid wear of the belt, which embraces the comparatively small disc on the axle of the fan, indicated that the continued bending of the strap fibres around a pulley of such small diameter caused the fibres of the leather to be cracked, and their internal organization to be broken up. The continually-recurring essential repairs of the belts are the only considerable impediments which interfere with the regular working of the centrifugal blowing-machines at high velocities.

The high-furnaces of the Nexa works, where the kind of blowing machines here described are in action, require about 1,109 cubic feet of air per minute. Unquestionable experiments have proved that the processes of reduction and fusion, as also the production of a good grey pig iron suitable for castings, are effected as rapidly and as advantageously with a blast of low pressure as with one of high, provided only that the

necessary quantity be introduced into the furnace. We have worked as well with a pressure equal to four lines of mercury, and with the same consumption of charcoal, as with twenty-four lines, and have obtained in the one case as in the other, under otherwise similar conditions, good products. The pig iron was of exactly similar characters in both cases.

Notwithstanding such results, the overseers of the works have not shown themselves altogether favourable to the centrifugal system of blast, and endeavour, as far as possible, to attribute to the system itself whatever disadvantage may result from their usual defects of workmanship, or from any casual occurrences that may exercise a disturbing action on the machinery. I have often remarked the stubborn prejudices exhibited against the system by otherwise able and enlightened overseers, and which for the most part arose from their ignorance of the dynamical arrangements of the mechanism. I have even heard it maintained that no pressure of blast could be produced in the blast-pipes, as the compressed air must naturally rush back through the open case. But in spite of all this, I am convinced that no other blowing machine, whether considered in relation to the expenditure of power required to work it, or to its working effect, surpasses the centrifugal blowing machine; and that as soon as the present system of driving bands and multiplying wheels can be replaced by another more durable system of gearing, this blowing machine will be found the simplest and best for charcoal high-furnaces. For this purpose its moderate first cost, trifling working expenses, great effective power, and the production of a blast of unsurpassable and perfect uniformity, especially recommend it.—*Polytechnisches Journal.—Artizan.*

## THE USE OF COAL IN LOCOMOTIVE ENGINES.

The following is a report by Messrs. Woods and Marshall, to the London and North Western Railway Company, on the burning of coal in locomotive engines:

Under the following resolution of the general locomotive committee of the 9th July, we have made a series of experiments on some of the engines of the southern division, with a view to report to you upon the questions submitted to us:

"Resolved,—That Messrs. Woods and Marshall be instructed to make trial of the various sorts of coal in the engines of the southern division, and to report to the next meeting of this committee whether coal can be efficiently and satisfactorily used, in what proportion, and at what cost, as compared with coke."

After conferring with Mr. M'Connell, and with a view to completing our report within the specified time, we judged it expedient to limit our experiments to the trial of two kinds of coal, and to a comparison of the performances of an engine of the class known as Mr. M'Connell's patent, with those of an engine of the "Bloomer" class.

The Hawksbury coal seemed to be most eligible for use on the southern division, on account of its being procurable at a comparatively low price, in consequence of the proximity of the pits to the main line of the southern division.

The pits are situate on the Coventry and Nuneaton branch, about four miles from Coventry, and yield a coal of hard quality, free from any excess of bituminous matter; and, in other respects (as, for instance, in freedom from clinker) favourable for combustion in engine furnaces.

Two qualities of this coal have been submitted by us to trial, viz., Main coal, which is delivered in large blocks free from small coal, and the coal termed "screenings," or "cobbles," which is delivered in small lumps, but free from dust or slack. The prices, as given to us by Mr. M'Connell, are—

| | |
|---|---|
| Main coal, delivered in contractor's wagons at Rugby | 9*s.* 7½*d.* per ton. |
| Cobbles, ditto | 7*s.* 8½*d.* ditto |

The cobbles are not so hard as the Main coal, and break into smaller fragments when struck by the hammer.

The cobbles can only be supplied in limited quantity.

For the purpose of comparison of the cost of working, it was important to obtain the exact duty of the engine with coke as well as with coal, and our series, therefore, includes the results of several days' work with the best coke we could obtain,—viz., Pease's West coke.

The engine worked alternate days with coke and coal, performing each day 164¼ miles, the double journey between Rugby and London.

The performances of the first two days are not here recorded, and may be considered as preliminary. The weather on one of these days was very stormy, and rendered the results of an exceptional character; and the men had not then acquired the knowledge of the management of a coal fire, which a little further experience gave them.

For six consecutive days (the Sunday ex-

cepted) the passenger engine No. 303, Mr. M'Connell's patent, worked the 12·55 p.m. up express train, and the 5·45 p.m. down train, three days with Pease's West coke, and three with the Hawksbury Main coal; these two trains being nearly equal in weight, and presenting little variation during the period.

The details of these, and the subsequent experiments, will be found in the table appended, but the following are the general results:

*No. 303 Engine.*

| Series. | Description of Fuel. | Miles run. | Average Load Carriages. | Average Speed per Hour. | Fuel consumed per mile. | Water Evaporated per lb. fuel. |
|---|---|---|---|---|---|---|
| | | | | Miles. | lb. | lb. |
| A | Coke ...... | 492¾ | 14·1 | 31·62 | 25·34 | 8·59 |
| B | Coal........ | 492¼ | 13·2 | 33·26 | 35·59 | 5·78 |

Deeming it necessary to ascertain the practicability of using coal with heaver trains, we caused the same engine, No. 303, to work the 6·30 A.M. down train and the 11·46 A.M. up train over the same ground. We had one day's experiment with coke, one day with Hawksbury Main coal, and one day with cobbles. The following are the results:—

*No. 303 Engine.*

| Series. | Description of Fuel. | Miles run. | Average Load Carriages. | Average Speed per Hour. | Fuel consumed per mile. | Water Evaporated per lb. fuel. |
|---|---|---|---|---|---|---|
| | | | | Miles. | lb. | lb. |
| C | Coke ...... | 164¼ | 19·2 | 29·41 | 26·80 | 8·82 |
| D | Main coal .. | 164¼ | 20·6 | 28·96 | 41·66 | 5·86 |
| E | Cobbles .... | 164¼ | 29·3 | 27·76 | 51·49 | 5·97 |

The remaining experiment we have to record is with one of the largest class of the ordinary engines, No. 293, working the 12·55 P.M. up, and 5·45 P.M. down trains, with Hawksbury Main coal. The engine has a large fire-box, with a longitudinal mid-feather and two fire-doors.

*No. 293 Engine.*

| Series. | Description of Fuel. | Miles run. | Average Load Carriages. | Average Speed per Hour. | Fuel consumed per mile. | Water Evaporated per lb. fuel. |
|---|---|---|---|---|---|---|
| | | | | Miles. | lb. | lb. |
| F | Main coal .. | 164¼ | 14·1 | 32·96 | 47·75 | 4·52 |

I. The question of the practicability of burning coal in such locomotives must be answered in the affirmative. The engines had no difficulty in maintaining the required pressure of steam and speed with the trains assigned to them.

II. Taking a general view of all the performances of the engine No. 303 with coal, the consumption, or rather non-production of smoke, was very completely attained.

In the majority of cases, both in travelling and standing, the engine was practically free from smoke, the trace being so slight as to be imperceptible without close examination, and we did not observe in any instance that the smoke emitted could be accounted a nuisance.

From these remarks we of course exclude the period of lighting the fire and getting up the steam, when the combustion is incomplete, and the production of smoke cannot be avoided.

The non-production of smoke, whilst the engine is working, no doubt depends very much upon the individual skill and care of the engineman and fireman, and demands very close and watchful attention on their parts.

The conditions under which the results related were obtained are as follows:

1. Working with a very thin fire on a large area of grate, and with fire-bars laid much closer together than is necessary for coke. By the large area of grate and thin fire, a large volume of air is enabled to pass through the ignited fuel under a moderate draught.

2. Frequent firing in small quantities to equalise the disengagement of the gases, and thereby prevent the production of a larger quantity at one time than can be saturated by the air passing through a grate or fire-door. This frequency of firing involves much greater care and labour on the part of the fireman. It was found in the trials, that, on an average, the fireman fired four or five times more frequently with a coal than with a coke fire. Say once in every two or three miles, instead of once in ten or twelve miles.

In throwing on the fuel the fireman has carefully to observe the state of the fire, that he may throw the fresh coal so as to maintain an uniform covering of the grate; the thickness of fuel ranged from about four to six inches.

3. *Alternate Firing.*—The fire-box, divided longitudinally by midfeather into two separate compartments, each provided with a fire-door, gives the means of firing alternately, and thus keeping a bright fire in one box, whilst the other is damped by the addition of black coal.

4. The combustion chamber allows of the mixture of the gaseous products of the two fires with the quantity of free oxygen needful to effect their due saturation, affording space for combustion to take place before the gases pass into the tubes. This arrangement, combined with the double box, renders Mr. M'Connell's engine a more perfect "smoke-consumer" than the common engine.

5. *Quality of the Coal.*—The coals were in lumps of moderate size, to prevent obstruction to the draught, and sudden generation of a large volume of gas, which ensues upon throwing small coal or dust into a bright fire. Hardness in the coal is a quality which tends to diminish the proportion of dust from breakage. The coal should contain as little bituminous matter as may be, and burn with little ash or clinker.

6. Damper, to regulate admission of air to the grate, must be capable of being closed wholly or partially, otherwise smoke will be emitted, and fuel wasted at the stations.

It must be understood that the above were the conditions observed, and apparently required, in working the engine No. 303 efficiently and satisfactorily with coal; but we do not assert that these are invariable conditions as applicable to other engines, the different construction of which might adapt them to burn coal in another way.

The experiment with No. 293 engine did not give so good a result in point of smoke burning; a brownish tint of smoke was pretty constantly observable, but though sometimes very light, was frequently decidedly objectionable.

On the other hand, it is fair to state that the man who drove it had not had much experience in burning coal, which, as may be inferred from our foregoing remarks, requires a management of the fire altogether different from that of a coke fire.

We believe, however, that general experience shows that the ordinary engine is not well adapted for smoke burning, and it is certain, that in the case of No. 293 the smoke-box became over-heated by a large accumulation of coal-dust partly ignited.

These effects were altogether absent in No. 303 engine, owing, doubtless, to the large receptacle in front of the tubes, which served to arrest and detain in the fire-box the smaller particles of coal which otherwise would have passed through the tubes.

III. Relative powers of coke and coal.

The comparison of series A with series B indicates a consumption of coal 40 per cent. greater than that of coke in working similar trains, the average loads and speeds being nearly the same; but the work, as indicated by the consumption of water, being slightly less on the occasions when coal was used.

The comparison of series C and D, with a heavier and slower description of train, gives a consumption of coal 55 per cent. greater than with coke.

Taking the quantity of water as probably the most correct approximate measure of the several resistances, we find the mean duties to be as follows:

1 lb. coke to 8·65 lb. water;
1 lb. coal to 5·83 lb. water;

which show a proportion of 100 lb. coke as equivalent to 148 lb. coal, as consumed in No. 303 engine.

We shall, therefore, assume 48 per cent. increase in estimating the relative cost of coal as compared with coke.

The more imperfect performance of No. 293 engine gives a much greater difference, being no less than 90 per cent.

The consumption of coke observed in these experiments accords very closely with the results of the experiments made under similar circumstances, and detailed in our former reports.

From the great excess in the quantity of coal consumed over coke, we are strongly disposed to think there must be something disadvantageous in the construction of the above engines, or in the mode of working

them, as regards their applicability for the use of coal as a fuel.

This view is confirmed by the results of some experiments made at Wolverton, in the fixed-engine boiler there, with the same qualities of coal and coke, wherein the difference of heating or evaporative power appears to be only 20 per cent., the evaporation being 7·99 lbs. of water per lb. of coke, and 6·77 lbs. of ditto per lb. of coal.

IV. Relative economy in cost of fuel.

The price of the Hawksbury Main coal being assumed at 9s. 7½d. per ton, and the price of Pease's West coke at 21s. 9d. per ton, which is the contract price for the same delivered at Rugby in the contractor's waggons, we may estimate that the cost of a quantity of coal equivalent to one ton of coke will be 14s. 3d., being 9s. 7½d. increased by 48 per cent.

Out of the 21s. 9d. paid for the above coke, we are informed that your Company receive back from the Midland Railway Company, under a special agreement, an allowance of 9d. per ton. This reduces the cost to Company to 21s. per ton.

The saving by use of coal would then be 6s. 9d. per ton., or the difference between 21s. and 14s. 3d.

Upon an annual total consumption of, say 74,000 tons on the southern division, the saving to locomotive power would be £24,975 from this cause.

This, however, assumes that all the engines are of a kind suitable for burning coal, and that no other fuel is used.

As far as our present experience goes, the large engines of the No. 303 class are the only engines on the line in which coal can be practically used without occasioning a nuisance, and these constitute at present but a small proportion of the entire stock.

The expediency of increasing the stock of such engines, for the purpose of effecting, wholly or partially, the saving in cost of fuel which we have indicated, is a question which your Directors will probably not consider within our province at present to discuss, involving as it does so many collateral considerations; also having reference to the general economy of the Company's expenditure—such as cost of engines and the general working expenses.

If the question be entertained as a general one for the whole line, the additional weight of fuel to be transported from place to place (whether in the wagons or on the tenders), and the additional number of hands necessary for emptying the wagons and distributing the coal, will occasion expenses which we have not taken into account.

Although we consider the experiments made with No. 303 engine satisfactory in point of smoke burning, we cannot resist the belief that the consumption of coal is in excess of what it ought to be, and that there is room for considerable improvement in this respect by means which shall tend to utilize the heat which is at present wasted.

## REPORT OF THE COMMISSIONERS OF PATENTS.

The following is an extract from the Report presented to Parliament 7th Aug., 1854:

In pursuance of several orders of the Commissioners of Patents, the whole business of the Commissioners relating to patents, from the petition for the allowance of provisional protection to the printing, publication, and sale of the specification, is now conducted in one office.

The office of the Commissioners is in Southampton-buildings, Chancery-lane, in a set of chambers lately occupied by the Masters in Chancery, and is open to the public from ten to four o'clock every day.

The number of applications for provisional protection recorded within the fifteen months from the 1st October, 1852, to the 31st December, 1853, was 4,256; the number of patents passed thereon, all having become due on the 30th June last, was 3,099; and the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,157.

The number of applications recorded within the first three months of the operation of the Act, was 1,211.

The number of applications recorded within the year 1853, was 3,045.

Though the Act received the royal assent on the 1st July, 1852, yet its operation was deferred to the 1st October following. During the intervening period almost all applications for patents were suspended, and this sufficiently accounts for the large number of applications (1,211) recorded within the quarter ending 31st December, 1852, as compared to the number (3,045) recorded for the whole year 1853.

The number of applications recorded in the first six months of the current year, was 1,440, showing a probable decrease of 165 applications upon the year 1854, as compared to the number of the year 1853.

All the specifications filed in the office upon the patents passed under the Act from 1st October, 1852, to the 30th June last, 3,099 in number, have been printed and published, together with lithographed outline copies of the drawings accompanying the same; and these are sold to the public, either separately or in the series for the year,

at the cost price of the printing and paper. The price of a specification of the average length of letter-press, and drawings, is eight pence.

There is no arrear in the printing and publication of the specifications filed since the commencement of the Act. Each specification is printed and published within three weeks of its deposit in the office.

Under the 15 and 16 Vict. c. 115 s. 4, a printed copy of the specification, duly certified and sealed in the Commissioners' office, may be received in evidence of the original document in any Court within the United Kingdom of Great Britain and Ireland and the colonies; the printed copy is certified on payment by the applicant of one shilling for the seal, and the charge of the draughtsman for colouring the prints of drawings is paid by the applicant.

Printed certified copies of all the specifications filed in the office from the 1st October, 1852, to the present time, with coloured printed copies of the drawings, have been sent to the office of the Director of Chancery in Edinburgh, and the enrolment office of the Court of Chancery in Dublin, pursuant to the Act, 1852, and the Act 16 & 17 Vict. c. 115; and such copies are open to the inspection of the public in the respective offices.

Certified copies of all the patents passed since the commencement of the Act, and certified copies of the record books of assignments of patents and licences, with copies of such assignments and licences, have also been sent to the Chancery offices in Edinburgh and Dublin, pursuant to the Act.

The whole series of specifications of patents for reaping machines, and drawings accompanying the same, from the first enrolled, 4th July, 1799, to the present time, have been printed and published, and are sold at the cost price of the printing and paper, either separately, or altogether, with an appendix in one volume. The appendix, compiled by Mr. Woodcroft, from a great variety of authorities and works, describes the instruments for reaping grain, published and in use, from the earliest period to the present time.

The whole series of specifications of patents for firearms, cannon, shot, shell, cartridges, weapons, accoutrements, and the machinery for their manufacture, and the drawings accompanying the same, from the earliest recorded, 15th May, 1718, to the present time, have been printed and published in like manner. An appendix is in preparation, and will shortly be published.

The Secretary of State for the Home Department has required the publication of all the specifications of patents for the consumption of smoke in furnaces, and for the making of drainage tiles applicable to sewerage; and the Board of Admiralty has required the publication of the specifications of patents for improvements in propelling ships: these three subjects are now in preparation.

Pending the publication of the old specifications, necessarily a work of time, printed certified copies for evidence in courts of justice, for counsel, and for other purposes, of any of the old specifications, may be obtained on application at the Patent Office, the applicant paying the cost of putting the drawings upon the stone and colouring the number of prints he may require, and the Commissioners paying the cost of letter-press and paper, or, in the absence of drawings, the applicant paying the cost of letter-press and paper; by this arrangement the applicant obtains twelve or fourteen certified printed evidence copies at a low price, and the Commissioners obtain the prints of drawings, or the letter-press and paper, for their future publication of the specification, free of cost. 100 old specifications have been printed in this manner within the last few months.

Mr. Woodcroft's chronological and alphabetical indexes of all the specifications of patents enrolled in Chancery, from 1617 to the 1st October, 1852, 14,359 in number, have been published in three imperial octavo volumes, and are sold at *50s.*, the cost price of printing and paper. Mr. Woodcroft's index, arranging these specifications according to the subject matter, is in the hands of the printer, and will shortly be published.

Indexes in the same chronological, alphabetical, and subject-matter form of all the specifications filed in the office under the new law, will be made in continuation, and published periodically.

The prints of specifications, the indexes, and all other printed papers, will in future be sold in the Patent Office, and not at the Queen's Printers as heretofore. The publications are sold to all persons applying for them at the cost price of each, and no trade discount is allowed. Booksellers and agents, however, charge a commission to the persons for whom they purchase these works.

The Commissioners have established a public library of research within the Patent Office, to consist of the scientific and mechanical works of all nations; convenient rooms are provided for the purpose, and the library will be open to the public within a few weeks.

A journal, entitled "The Commissioners of Patents Journal," has been published twice a week since the commencement of the present year, and it will be continued.

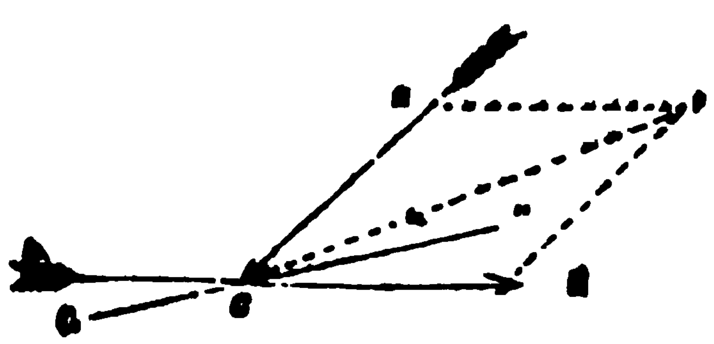
It contains the various notices appearing in the *Gazette* on the subjects of patents, and a variety of other notices and useful information and instruction for the guidance of applicants in proceeding for their patents. It is proposed to publish in the journal the names of patentees, and the titles of patents granted in other countries; also a notification from time to time of the date of the expiration of each patent as it may become void, either by reason of non-payment of the stamp duties of £50 and £100 at the expiration of the third and seventh years respectively, pursuant to the Act, or at the full term of fourteen years; and also from time to time a list of the inventions provisionally protected, lapsed or forfeited by reason of the applicants having neglected to proceed for their patents within the six months of provisional protection. The price of the Journal to subscribers is 30*s.* per annum.

## ON PROPELLING SHIPS BY WIND AND STEAM POWER.

*To the Editor of the Mechanics' Magazine.*

SIR,—You lately inserted a few observations by me on the work done by marine propellers, in which they were supposed to work independently. You will perhaps receive with equal favour some reflections on the effectiveness of propellers when working in conjunction with a vessel's sails.

Suppose V to be the velocity of the propeller, $v$ that of the ship, then the resistance of the vessel's motion (following the ordinary theory) may be denoted by $kv^2$, and the reaction of the propeller by $H(V-v)^2$. Referring to the diagram, let



DB represent, in magnitude and direction, the velocity of the vessel, ED that actually of the wind; then FD, the diagonal of the parallelogram, ED BF, will be the apparent direction of the wind on board the ship, and the line GDH bisecting the angle FDB, will be the best direction for trimming the sails. Let the rate of the breeze be $v^1$, and the angle EDB equal to $\theta$, angle FDB$=\phi$.

$$DF^2=v^2+v^{1\,2}+2v\,v^1\cos.\theta,$$

and the effective pressure in the direction of motion exerted by the wind on the sails, is properly denoted by

$$k^1\left\{v^2+v^{1\,2}+2vv^1\cos.\theta\right\}\sin.^2\frac{\phi}{2};$$

we have, too,

$$\frac{\sin.\phi}{\sin.\theta}=\frac{ED}{EF}=\frac{v^1}{\sqrt{v^2+v^{1\,2}+2vv^1\cos.\theta}}.$$

Whence we may readily determine $\sin.\frac{\phi}{2}$ in terms of $\theta$ and the velocities, and so express the effective force of the wind in terms of these quantities.

And we shall see by the said expression what we can of course perceive *a priori*, that as the velocity $v$ of the vessel increases, the effectiveness of the wind diminishes, so that a breeze which would exert a considerable propelling power, if allowed to act alone, might be rendered nearly valueless when assisted to any appreciable extent by the steaming power of the vessel.

The equilibrium of the power and the resistance gives us the following equation when our ship uses both modes of propulsion:

$$H(V-v)^2+k^1\left\{v^2+v^{1\,2}+2vv^1\cos.\theta\right\}\sin.^2\frac{\phi}{2}=kv^2.\quad\ldots\quad(\text{I.})$$

Here we may pursue the foregoing observation, and say that, not only does the action of the engine diminish the power of the wind, but the increase of $v$ caused by calling the wind into play, lessens the useful effect of the engine; or, what amounts to the same thing, makes it necessary that the engine should do more work in order to produce the same propelling force, for if $v$ increases in the expression for this force,

$$H(V-v)^2,$$

then V must also increase, that is, the work of the engine must increase.

To serve as an example of this, we will take the simple case when the wind is all in the direction of the ship's course, and suppose its velocity to be twelve knots, and the sails of the vessel such that this breeze, if acting alone, will produce the rate of eight knots. And let the power of the engine be capable of sustaining, when working independently, the same velocity. Since $\theta=\pi$ equation (I.) becomes:

$$H(V-v)^2+k^1(v^1-v)^2=kv^2\quad(\text{II.})$$

And if the slip of propeller be twenty per cent.

$$H(10-8)^2=k\times 64.$$

when engine works alone,

$$\text{or } \frac{H}{k}=\frac{64}{4}=16.$$

Again, $k^1(12-8)^2=k\times 64$, when the wind acts alone, and hence,

$$\frac{h^1}{h}=\frac{64}{16}=4.$$

So (II.) becomes

$$4\,(V-v)^2+16\,(12-v)^2=v^2.$$

And since the work of the engine is constant, we have the additional equation,

$$H\,(V-v)^2\,V=H\,(10-8)^2\times 10$$
$$(V-v)^2\,V=40\,;$$

$$\text{Whence, } 4\,(V-v)^2=\frac{160}{V}.$$

$$\text{So, } \frac{160}{V}=v^2-16\,(12-v)^2$$
$$=394\,v-15v^2-2304,$$
$$\text{and } V=\frac{160}{394\,v-15\,v^2-2304}.$$

By trial we find the value of $v$ to lie between 8 and 9 knots, so that with wind and steam together the speed would not be greater by one knot than it is when either motive power is used alone.

Yours, &c.,

A MECHANIC.

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## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

*To the Editor of the Mechanics' Magazine.*

SIR,—In answer to my remarks, "A Mechanic" repeats, what he has stated before, that the resistance of the paddle is always equal to that on the bows; which is exactly what remains to be proved.

I took occasion to observe to "A Mechanic," that if $v'$ had nothing to do with the propulsion of the ship, it could have nothing to do with the resistance, R, of the ship, and that, therefore, the quantity, R$v'$, must remain entirely out of the question. In this there is no mystery. What has the speed of a locomotive engine to do with the resistance of a train which it does not draw?

I am now told by "A Mechanic" that the velocity, $v'$, is most essential to the propulsion. I think so too. But in doing what is the power, R$v'$, expended? If in propelling the ship, R$v'$ could scarcely be considered as so much power lost.

"A Mechanic" knows very well, that if, as he says, the work done by the propeller could *never* be equal to the work done by the resistance of the ship, the propeller and the ship could *never* attain uniform motion. "A Mechanic" cannot, therefore, seriously entertain such an idea.

If I have misapprehended "A Mechanic's" views with regard to the circumstances which determine the power of the engine, and the speed of the ship and velocity of the propeller, the fault does not rest with me. The expression, R $(v+v')$, establishes no relation whatever between these quantities. Is it to be understood that the resistance, R, of a ship, moving through the water at the velocity, $v$, varies with the mode of propulsion? If a horse, in towing a ship at the velocity, $v$, has to draw the load, R, does that load increase when the same ship is propelled, at the same velocity, by a propeller? Then, what are the additional elements of resistance? What is the work, R $(v+v')$, done by the propeller, equal to, besides being equal to itself?

The facts which are calculated to throw light upon the question whether the ship, and the obliquity of the blades, indicate a loss of power, are, fortunately at hand:

| Diameter of the Screw 9 M. Screw. | Pitch | Slip. | Efficiency. | Horse power. Speed of Ship 9·3 Knots. |
|---|---|---|---|---|
| | M. | | | |
| 17. | 2·888 | 0·3375 | 0·07695 | 202·6 |
| 10. | 2·396 | 0·2850 | 0·07512 | 205·8 |
| 23. | 3·512 | 0·3887 | 0·07400 | 218 |
| 9. | 2·053 | 0·2467 | 0·07133 | 218·4 |
| 8. | 2·459 | 0·2900 | 0·07402 | 210·6 |
| 7. | 2·414 | 0·2728 | 0·07273 | 214·8 |
| 13. | 2·673 | 0·2860 | 0·07195 | 216·9 |
| 7. | 2·010 | 0·2305 | 0·06915 | 225·5 |
| 15. | 3·000 | 0·3299 | 0·07406 | 208·9 |
| 4. | 2·120 | 0·2700 | 0·07351 | 212·3 |
| 18 | 3·040 | 0·3430 | 0·07474 | 203·7 |
| 11. | 2·868 | 0·3142 | 0·07467 | 208·2 |
| 10. | 3·455 | 0·3315 | 0·07229 | 209·2 |
| 6. | 2·595 | 0·2516 | 0·06963 | 223·8 |
| 22 blz. | 2·875 | 0·4020 | 0·07090 | 220·1 |
| 20. | 2·695 | 0·2658 | 0·07051 | 221· |

The above results of experiments, made with a ship called the *Pelican*, are taken from the well-known "Treatise on the Screw-propeller," by J. Bourne, C.E., Appendix, page V., Table V. If "A Mechanic" will be good enough to point out to me in what respect they coincide with his views, I shall be obliged to him.

As Plate II., in the Treatise already mentioned, furnishes an indicator diagram of the *Rattler's* engines, obtained whilst that ship was towing the *Alecto*, as well as other diagrams of the same engines, taken when the *Rattler* had no ship in tow, I hope "A Mechanic" will have the goodness to show me how he applies his rule when a comparison is to be established between the powers of engines working under such different circumstances.

With regard to the slip of the paddle-wheel and that of the screw-propeller, I will only say, that the former is the difference between the mean velocity of the propelling-area and the speed of the ship; whilst the latter is computed without any reference to the velocity of the propelling-area. Consequently there can be no comparison between them.

I am, Sir, yours, &c.,

August 21, 1854.

Y.

## AN EXTRACTOR OF SQUARE AND CUBIC ROOTS.

By C. I. Recordon.

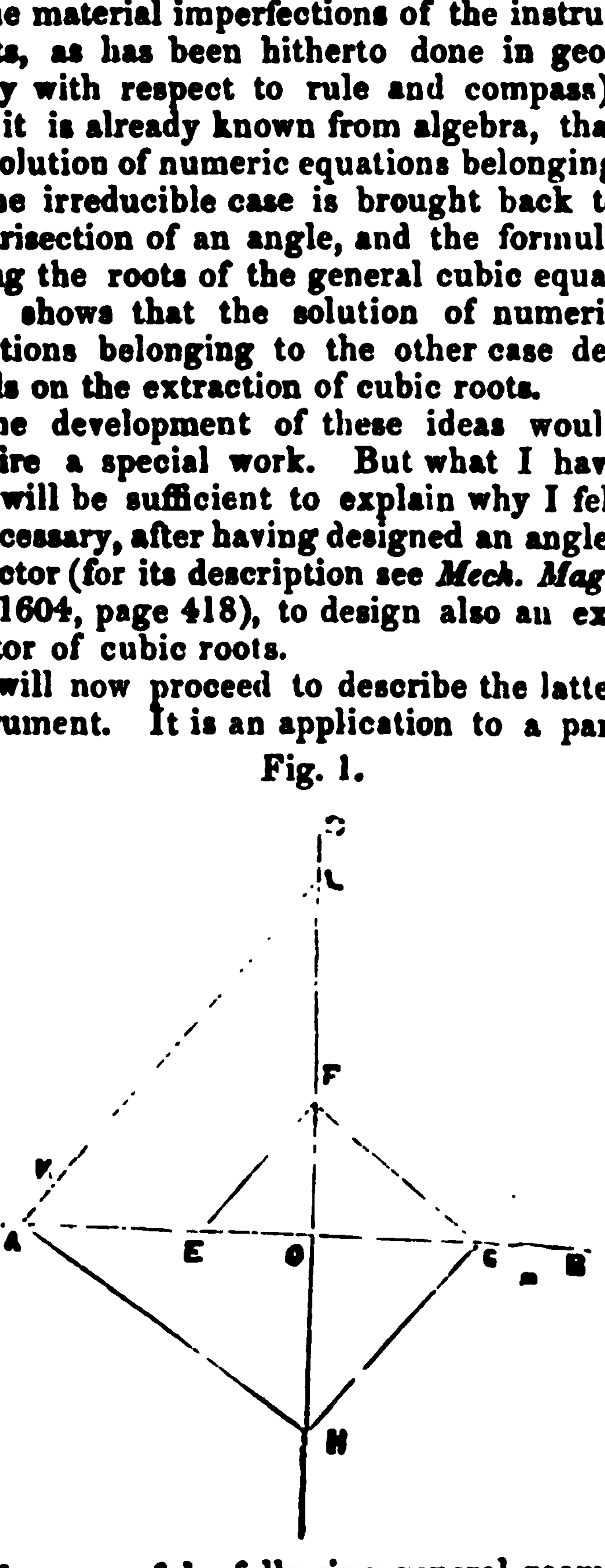
The multiplication of the cube, like the trisection of an angle, is a problem insolvable by rule and compass. Both problems depend analytically on the solution of cubic equations; but there is this difference between them, that the first depends on the *irreducible case* of those equations, in which the three roots are real, whilst the second depends on the solvable case in which only one root is real.

Invertedly, if we have instruments for solving these two problems, we can say that the solution of the two cases spoken of depends on these instruments. (This of course supposes that we neglect the consideration of the material imperfections of the instruments, as has been hitherto done in geometry with respect to rule and compass). For it is already known from algebra, that the solution of numeric equations belonging to the irreducible case is brought back to the trisection of an angle, and the formula giving the roots of the general cubic equation, shows that the solution of numeric equations belonging to the other case depends on the extraction of cubic roots.

The development of these ideas would require a special work. But what I have said will be sufficient to explain why I felt it necessary, after having designed an angle-trisector (for its description see *Mech. Mag.*, No. 1604, page 418), to design also an extractor of cubic roots.

I will now proceed to describe the latter instrument. It is an application to a par-

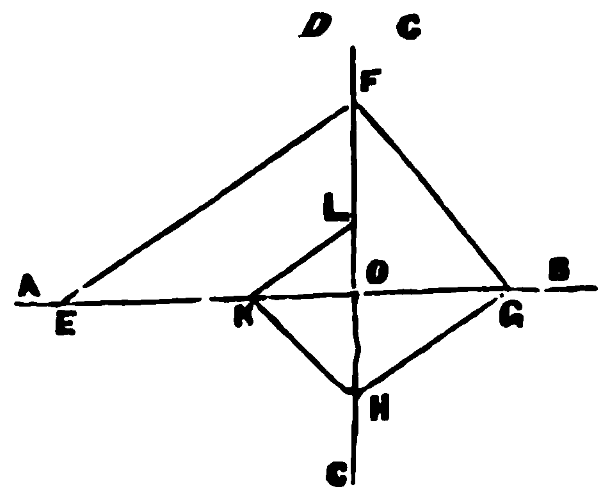
Fig. 1.




ticular case of the following general geometrical theorem:

Let A B, C D (fig. 1 and fig. 2), be two straight lines intersecting one another at right angles, in the point O. From O A, O D, cut off O E, O F, respectively, and join E F. Then, from F draw F G at right angles to E F, and cutting O B in G. From G draw G H perpendicular to F G, and cutting O B in G. From H draw H K perpendicular to G H, and cutting O A in K,

Fig. 2.




and so on. Let us now consider O A as representing a unit, and O F any numerical value $x$, we shall have,

| | |
|---|---|
| in △ E F G: | $OG = x^2$ |
| in △ F G H: | $OH = x^3$ |
| in △ G H K: | $OK = x^4$ |
| . | . |
| . | . |
| . | . |
| . | . |

The base of the instrument is a metallic plate L M N B P (fig. 3), having the form of a trapezium, whose angles at P and N are right angles, and whose diagonals P M and N B L are perpendicular to each other. This plate has grooves, B M, B N, B P cut in it, and in these grooves are small sliding pieces carrying vertical round pins, E, D, C. G D K is a rectangular piece laid on this plate, having two slits, D R, D S, in which the two pins, E, C, fit, and a round aperture at D to receive the third pin. F C H is another rectangular piece, having a groove cut in it, upon the under surface of the branch, C F; in this groove the prismatic piece, D G, must slide. In the branch C H is a slit, in which a fixed vertical round pin, A, fits. In B is also a vertical pin.

The further conditions of the construction of the instrument are as follows: The geometrical axes at D, B, A and at C, B, E, must be constantly in two planes perpendicular to each other. The pin, C, must pass through the slit D S, and enter with little friction the piece, H C F, at C. The points, A, B, C, D, E must be on one level.

For greater convenience a scale is engraved on the part M N of the plate, giving different fractions: as, 100ths, 120ths, 27ths of the unite B A.

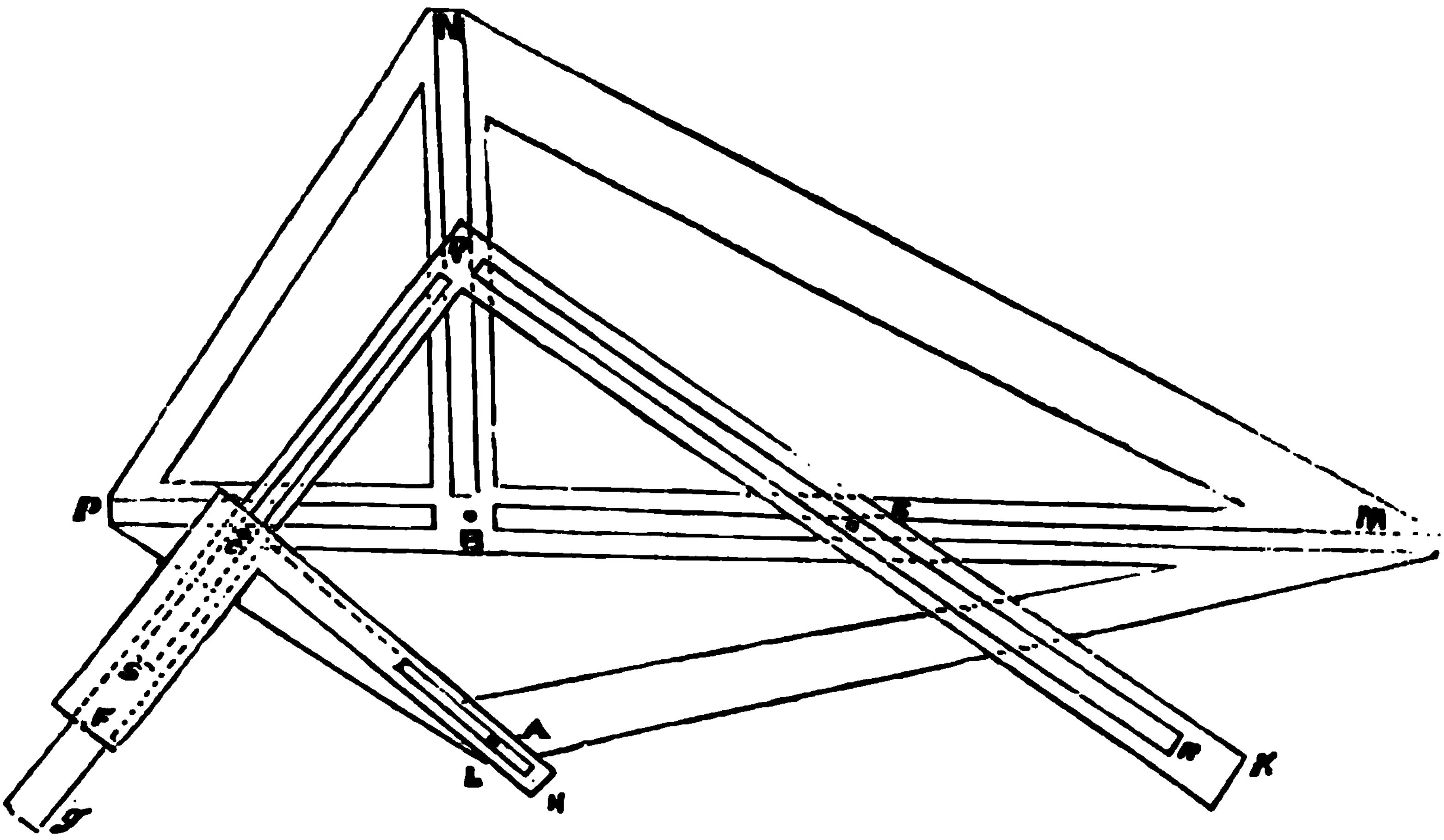
To apply the instrument for extracting cubic roots, move G D K, until B E repre-

sent the given numerical value; then B C will represent the cubic root of the same value.

To apply the instrument for extracting square roots, make B D represent the given numeric value, then B C will represent the square root of this value.

B E and B D having necessarily limits' we shall extract cubic and square roots of very small or very large numbers by multiplying or dividing them by such an exact cube, that the instrument may be applied to the product or quotient. This condition will be satisfied if the greatest value of

Fig. 3.




B E be greater than eight times its least value, because 8 is the greatest value of the expression $\left(\frac{a+1}{a}\right)^3$, where $a$ is an integral number. Having found the cubic or square root of the product or quotient, the required root will be obtained by dividing or multiplying the first root by the number whose cube or square was taken as factor or divisor.

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## ON MARINE BOILERS.

BY J. A. ROEBLING, C.E., NIAGARA.

The furnace of a boiler should be so constructed as to render combustion as perfect as possible, but it can do no more than produce carbonic acid. If only one-half of the oxygen necessary to form carbonic acid combines with carbon, the result will be carbonic oxide, a product of imperfect combustion. A certain supply of atmospheric air, therefore, is necessary. But this supply may be too copious or too scant; it may enter the furnace too rapidly or too slow, but it cannot be too high for rapid combustion. It is also evident that the quality of the fuel must have a controlling influence upon these various conditions. Wood as fuel for marine boilers is out of the question; we can only consider mineral coals—anthracite and bituminous—as fit for ocean steaming. It is not my intention here to analyze these varieties; I only notice them in so far as their peculiar qualities require peculiar mechanical arrangements for good combustion.

Soft or bituminous coal requires more time to be consumed, economically, than hard coal. The large bulk of hydrogenic and bituminous compounds, mixed up with floating particles of carbon, which result from the burning of soft coal, require to be thoroughly mixed with heated air before perfect combustion can take place. The mechanical arrangements to effect this are of great importance, but may be overlooked when hard or anthracite coal is consumed. This fuel admits of a much more rapid consumption and of a powerful blast, while the draught of a soft coal furnace should not be very strong.

Experience has not yet settled the most economical speed of consumption of mineral coals. Watt's rule was to allow one superficial foot of grate surface for every ten

superficial feet of heating surface; and this rule produces good results with natural draught. The boilers of the Collins' steamers are undoubtedly the most efficient and best constructed boilers now in use either here or in Europe. According to Mr. Isherwood, those of the *Arctic* contain 0·357 feet of grate for 11·84 feet of heating surface for every effective horse-power, or 33 feet of heating surface for 1 foot of grate.

According to the same author, whose account of the performance of the *Arctic*, published in the "Journal of the Franklin Institute," appears to be reliable, the average consumption of anthracite during six trips was 7,980 lb. per hour. The aggregate grate surface of the four boilers of that steamer is 588 feet, which gives 13·57 lb. of coal per hour for each foot of grate. In boilers of ordinary construction with natural draught, half the weight of soft coal would be a fair consumption.

Chemists who have examined the evaporative power of various fuels agree that 1 lb. of good mineral coal, perfectly consumed, will evaporate over 11 lb. of boiling water. Experiments on a larger scale will seldom evaporate more than 9 lb. to 10 lb. The boilers of the *Arctic*, during those six trips, evaporated 7½ lb. of steam from water of 110° by 1 lb. of anthracite, and this is one of the highest results that has been obtained in the regular working of marine boilers. It is evident, therefore, that there is room left for improvements. There is still a waste of fuel in the Collins' steamers, which arises from imperfect combustion, the result in part of a faulty construction, and no doubt in part is attributable to imperfect stoking. Much of course depends upon the mode of firing, nor is it always practicable to carry on this important part of the service according to the best rules.

In attempting to improve the construction of boilers, we may receive good hints from an examination of the condition and working of other furnaces, in which good combustion and a high degree of heat are important objects. Furnaces used in the manufacture of iron, such as blast, puddling, heating, and annealing furnaces, may be referred to.

Perfect combustion can only take place under such circumstances as are favourable to the development of intense flame and heat. Aside from the necessary quantity of air supplied at a certain rate, and heated if possible, there are other contingencies upon which success depends; a very important one is the nature of the material which surrounds the furnace, forms its walls and roof, and comes into immediate contact with the fire. The question, then, at once arises, can the process of combustion be successfully carried on in a narrow furnace, surrounded by iron walls and roof, in contact with water, which absorbs the heat at a rapid rate? Most certainly not. Who would undertake to heat and puddle iron in a furnace built of iron plate in contact with water? Iron water-boshes are sometimes resorted to, but they have a tendency to retard the process, and should be avoided if possible. Such furnaces are constructed of good fire-brick, which is a slow-absorbing and slow-conducting material, and after being glazed over by the strong heat will strongly reflect it. By this strong reflection and non-absorption, the process of combustion is supported in an eminent degree, so much so, that a degree of heat is obtained far exceeding the temperature of any boiler furnace. As little heat as possible should be absorbed by the walls or roof of a boiler furnace; every endeavour should be made to reflect and concentrate the fire. Imperfect combustion in any furnace most generally arises from the fact that the heat is not allowed to accumulate and concentrate. The sole object of a boiler furnace should be to favour combustion, and to develope flame and blaze, and this can only be accomplished under the influence of a highly concentrated and excited action. The caloric stream thus fully elaborated, on leaving the furnace is then allowed to expand itself, and to be absorbed by the interior surface of the boiler.

I may remark here, by way of general comment upon furnaces for heating houses, that the whole tribe of *Patent Furnaces* with which the country is blessed, have all, more or less, grown out of erroneous notions, and are the offspring of profound ignorance of the laws of combustion and of heat. Aside from the vitiated air they supply, they are all wasting fuel at an enormous rate. This subject is better understood in the north of Europe, where long winters and scarcity of fuel have taught men to build furnaces on correct principles.

The temperature of a puddling or heating furnace has to be raised to about 3,000°; this can only be accomplished under the reflecting and reverberatory action of the walls and roof. A concentrated blast may produce a greater heat at a certain point, but it will not be diffused. Under the above circumstances, and by means of a strong blast, from three to four times as much fuel may be consumed on the same surface of grate in one unit of time as can be accomplished in a common boiler furnace. In a well-constructed heating-furnace at my rolling-mill at Trenton, N. J., 8,000 lb. of anthracite are consumed in ten hours for the heating of 18,000 lb. of charcoal hammered blooms, on a grate of 20 superficial feet,

which is equivalent to 40 lb. per hour on 1 foot of grate. This cannot be accomplished in the furnaces of the Collins' steamers, which consume 13½lb. per hour on 1 foot of grate.

In the above a principle is delineated, which to my knowledge has been entirely overlooked, and which must be satisfied before we can attain much higher results.

Another glaring defect in all marine boilers, those of the Collins' steamers not excepted, is the want of room necessary for a due mixing of the gases, and a full development of the blaze.

Large quantities of fuel in a narrow and low furnace cannot be consumed without waste. In order to become fully excited and most positive in its action, the blaze of a fire must be at liberty to extend and elongate in the direction of the draught to a distance corresponding to its bulk, and without meeting absorbing obstructions. For illustration, I again refer to heating and puddling furnaces. This fact can be readily ascertained in an experimental furnace with adjustable roof. The brightest fire will burn under the highest roof, while the depressing action of a low roof will damp it, and reduce the temperature of the furnace.

Economy of space is an important consideration in the planning of a marine boiler, but this may be carried so far as to seriously interfere with the grand object of the boiler. In an efficient boiler, the extension of the furnace should form an empty area, which serves as a receptacle for the caloric stream where the gases become thoroughly mixed and fully ignited before their caloric is expended upon the boiler surface. And for the purpose of allowing ample time to the heat to be absorbed by the tubes, the above space, together with the tube area, should be as large as possible. The arrangement must be so, that the draught between the furnace and the chimney should be very slow, so that all the caloric, or nearly all, may be absorbed before the unconsumed gases are allowed to escape.

The boilers of the *Arctic* have 33 feet of heating surface for 1 foot of grate surface; this allowance is scarcely enough for hard coal—40 to 1 will not prove an excess. But this proportion depends, in a great measure, upon the velocity of the draught through the area which contains the tube or heating surface. The larger this space, or the longer its extent, the slower the motion of the gases will be, or the more extended their travel, consequently the longer they will remain in contact with the tubes. It is a very general defect in marine boilers, that the draught from the furnace to the chimney through the tube area, or through the flues, is nearly uniform, and too rapid. The "hanging-sheets" in the boilers of the Collins' steamers were designed to arrest this rapid flow, but they are not sufficient. The fact is, that the common plan of flue or tube boilers does not admit of a thorough application of the important principle in question; hence the necessity of a radical change.

Other questions of importance have to be considered in the planning of a marine boiler. Strength, facility of construction, and repairs, provisions against unequal contraction and expansion, against incrustation, facility of blowing out, and of cleaning, safety against exposure of heating surface when the ship is rolling or careening; all these are important points, but more or less understood. By the above remarks, I have only attempted to direct attention to such points as are not generally understood, and consequently neglected. In a new plan of boilers which I have invented, all the essential conditions of perfect combustion, radiation, and absorption are fulfilled, and is calculated to produce much higher results than have been obtained heretofore.

In conclusion, I will yet remark, that the subject of *artificial* draught is, in a great measure, an open question yet. The common fan-blast will answer very well under certain conditions, but in marine boilers, I am satisfied, *exhaustion* by proper mechanical means will work better. The control of large and connected fires can be better maintained by *exhaustion* than by *blast*, and also more economically.—*Scientific American.*

## ON THE SPECIFIC HEAT OF GASES.

BY M. REGNAULT.

M. REGNAULT read to the Academy of Sciences, at Paris, a very long memoir on the specific heat of gases under constant pressure and variable volume, and under constant volume and variable pressure. After detailing the history of this important question, M. Regnault explained in a brilliant lecture his method of observation, the arrangement of his apparatus, and the important results which he had obtained, results which entirely change the present state of the science, being in complete discordance with the theory of Laplace and Poisson, and with the observations of MM. Clément Désormes, Gay-Lussac, Welter, and Dulong.

It has been heretofore admitted, that the capacity for heat under constant pressure, is always greater than that under constant

volume; and the ratio of these capacities is equal to unity plus a fraction, which, in air, is 338 thousandths, according to Dulong, 375 according to Gay-Lussac, 421 according to Poisson, &c. By operating in an entirely new mode, and under conditions that he thinks better, M. Regnault seems to have shown that the difference between these capacities is nothing, or infinitely small. We shall re-publish almost entire M. Regnault's memoir, and shall cite here only a few of his experiments and the conclusions which he has deduced.

Conceive two concentric globular vessels, one, whose capacity is a litre filled with gas (air, for example), under a pressure of ten atmospheres, the other with a capacity of ten litres. This system of two vessels is immersed in a water bath kept at a constant temperature. If, after having made a vacuum in the second globe, we allow the air to enter it from the first, so that it now occupies a bulk ten times greater, there is neither elevation nor depression of temperature. There will be, however, a depression of the temperature, if at the same time that the air enters the larger globe, a small quantity of air is allowed to pass out by an orifice in the globe; and the amount of depression of the temperature is constantly proportional to the mass of gas which has escaped into the atmosphere. If the air which escapes is made to do work, as, for instance, to move a turbine, reaction wheel or pump, the cooling increases in proportion to the work done; and we, in consequence, find here, what has been determined in steam-engines, in which the useful work done is more nearly expressed by the heat lost in the fall of temperature, in proportion as the machines are more perfect.

M. Regnault shows clearly how much his new experiments are opposed to the old hypothesis which made *caloric* a fluid, at one time in a latent state, at another, disengaged and sensible; he shows, on the other hand, how easily they are explained on the theory which attributes heat to a vibratory motion; the principle of the preservation of moving forces, then, suffices to account for all the transformations of heat into work, and *vice versâ*. After again insisting upon the fact that the theory by which Laplace corrected Newton's formula for the velocity of the propagation of sound in air, and explained the considerable difference between the calculated and observed velocities, is no longer admissible, he expresses an ardent desire to see some new series of experiments on the velocity of sound in air, water, and solid bodies, taking advantage of all the recent progress of science and the mechanic arts.—*Franklin Journal.*

## MERCURIAL SAFETY-VALVE.

*To the Editor of the Mechanics' Magazine.*

Sir,—The remarks and suggestions of the inexperienced must often appear presumptuous and unnecessary to older and wiser heads; but as the fear of incurring censure ought not to deter any one from attempting to render service to the community, I therefore beg leave to ask you, "in the matter of safety-valves for steam-boilers," would not an enlargement of the principle of the mercurial steam-pressure-indicator prove the most simple and effectual safety-valve for steam-boilers? A large bent iron open tube (of diameter proportionate to the capacity of the boiler) passing from the steam-chest downwards, and again brought upwards into a receiving vessel, provided with an orifice communicating with the interior of the furnace, the lower portions of this tube being filled with mercury, would offer any required resistance to the passage of steam from the boiler, the degree of resistance depending not upon weighted mechanical arrangement, liable to become fixed, but simply upon the height of the discharge end from the lowest part of the tube. This fluid resistance being overcome by the pressure of steam from within the boiler, the mercury would be discharged from the tube into the receiving vessel, and the steam pass on into the furnace and extinguish the fire. Should the sudden withdrawal of heat from the boiler cause in it a tendency to collapse, the same tube would then admit a sufficient supply of air into the boiler to prevent such a catastrophe, and thus the only loss occasioned by the negligence of the attendants would be a trifling one "of mercury" instead of "loss of human life."

I write in ignorance whether such a contrivance is in use or not.

I remain, Sir, yours, &c.,

Edward Cocks.

## PATENT SELF-ADJUSTING RAILWAY AND OTHER BREAKS.

*To the Editor of the Mechanics' Magazine.*

Sir,—Among the specifications of patents filed and reported in your last Number, is one by Mr. John Jennings, the younger, for improvements in breaks for railway and other carriages, bearing date February 11, 1854. This invention, it is said, "consists in attaching breaks to the buffers of railway carriages, and to carriages for common roads, in such manner that the backing of the horse may bring them into action." In both branches of his invention Mr, Jennings would seem to have been

forestalled; for on reference to page 110 of your 35th Volume, it is there stated that in the month of August, 1841, Mr. Joseph Bunnett, of Deptford, obtained letters patent "for certain improvements in locomotive engines and carriages," where, among other highly ingenious contrivances, are contained several methods of "attaching breaks to the buffers of railway carriages," and an illustrated description thereof was given at page 273 of your 37th Volume.

More recently your Magazine* announces the grant of a patent in December, 1853, to Mr. Buck, of Wellington, for "an improved apparatus for retarding or stopping the progress of wheel carriages;" which invention consisted in "attaching breaks to carriages for common roads, in such manner that the backing of the horse may bring them into action."

During the past ten years much expense has been incurred, and great pains taken to impress upon the various railway companies a due sense of the value and importance of *self-acting* breaks, but without producing any conviction in the minds of the proverbially obtuse perceptions of these bodies. A convenient and effective method of applying self-acting breaks to common road vehicles being available in a field neither so exclusive, nor so hedged about by vested interests as railways, holds out a greater promise of usefulness, as well as probability of reward. From this field, however, Mr. Jennings is shut out by the patentee who has preceded him.

I remain, Sir, yours, &c.,
WILLIAM BADDELEY.

13, Angell-terrace, Islington, Sept. 7, 1854.

## ON WATER AS A CONDUCTOR APPLIED TO ELECTRIC TELEGRAPHS.

*To the Editor of the Mechanics' Magazine.*

SIR,—My attention being frequently drawn to the subject of electric telegraphs, a question has more than once presented itself to me, which I have been unable satisfactorily to solve. It is well known that water is a good conductor of electricity, and its value as affording the means of maintaining electric communication between distant places with a single wire, was satisfactorily established by the experiments of Mr. Alexander Bain, in Hyde-park, and fully detailed in your Magazine. In these experiments, a message sent through an insulated metallic wire, was returned, and the circuit completed, by the intervening mass of water—or even by the natural moisture of the earth, without, I believe, any appreciable loss, either of time or power. Very extensive practical use has already been made of the fact thus established; but how does it happen that so econonical a conductor is not more extensively employed, even to the superseding of metallic wires?

In communicating between very distant places—as England and America, for instance—the saving in expense of making and laying down a series of *hydraulic*, in lieu of *metallic* conductors, would be very considerable. I confess, I can see no reason for doubting the efficiency of such a conductor; neither do I perceive any difficulty in its application, which ordinary care and intelligence would not easily overcome. The following is a manner in which I think the end in view might be carried out: Let any required number of strong tubes of gutta percha (say seven, for instance) be enclosed within an outer, or covering tube. The strength of this material thus combined would be very great, and any required length could be joined up continuously in a perfect manner. The ends of the tubes should terminate in separate small cisterns at the two ends of the line, within which should be immersed metal plates connected by wires to the telegraphic apparatus. The tubes being filled with water, and a provision made for keeping them and the cisterns full, the apparatus would at all times be ready for use. Each thread of fluid, like wires similarly situated, would be perfectly insulated from its neighbour, and the circuit might be completed by returning the current through the earth, as at present. The fluid vein would, I believe, present a larger conducting body than a wire of similar size, the external surface only of which is a conductor.

I remain, Sir, yours respectfully,
WILLIAM BADDELEY.

13, Angell-terrace, Islington, Sept. 9, 1854.

## LONG-RANGE RIFLE CANNON.

*To the Editor of the Mechanics' Magazine.*

SIR,—I read in the public papers that a failure in experiments with the 68-pounder rifle-cannon was perpetrated a few days ago in presence of Her Majesty at the Needles, Isle of Wight. Had the shot or shell been constructed after the manner described in my pamphlet on Projectiles, page 18, there would have been no failure. I am justified in believing so, from the fact that I fired more than one hundred shot and shell from my four-groove rifle-cannon in the Victoria Park, frequently using the same shot and shell over again without a single failure. I will engage also to discharge shot made of

* Vol. lx., page 591.

mud, the mud to be properly cooked by previous pressing and baking, after the most approved manner of patented brick-making.

I am, Sir, yours, &c.,

J. Norton.

Victoria Hotel, Cork, Aug. 28, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Ramsbottom, John, of Longsight, Manchester, engineer. *Improvements in welding.* Patent dated February 21, 1854. (No. 408.)

These improvements consist mainly in giving a reciprocating rubbing motion to the parts to be welded.

Osborne, Frederick, of Aldersgate-street, London, tailor. *Certain improvements applicable to the cutting out of garments.* Patent dated February 24, 1854. (No. 409.)

This invention consists in the use of a permeable bed for supporting the cloth while it is subjected to the cutting operation, whether such operation be performed by a reciprocating knife, or by the pressure of dies.

Gedge, John, of Wellington-street South, Middlesex. *Improvements in the construction or adaptation of certain fittings for gas.* (A communication.) Patent dated February 21, 1854. (No. 411.)

The inventor attaches to the gas pendant a metal circle of a suitable size, and furnished with numerous small branches, each having a fish-tail burner on its end. He also employs a funnel or dip tube for reducing evaporation.

Pernollet, Victor, engineer, of Broad-street, Golden-square. *Improvements in machinery or apparatus for sorting or separating wheat and other grain from different kinds of grain, and for separating or removing extraneous matters from wheat and other grain.* Patent dated February 21, 1854. (No. 412.)

This invention consists in constructing vessels with holes of different sizes and shapes in their sides, and in mounting such vessels upon an inclined shaft or axis, by which a rotary motion may be communicated to them.

Walker, Robert, of Glasgow, Lanark, North Britain, merchant. *Improvements in signalling by voltaic electricity, for the purpose of increasing the safety of railways.* Patent dated February 21, 1854. (No. 414.)

This invention consists in establishing along the line of railway at the ordinary stations galvanic indicators, of the kind commonly employed for telegraphic purposes, and connecting them with a double line of conducting wires, extending from one station to the other, or over the entire line.

Boydell, James, of Gloucester-crescent, Regent's-park. *An improvement in the manufacture of hurdles and gates.* Patent dated February 21, 1854. (No. 415.)

This invention consists in obtaining greater strength, in the manufacture of hurdles and gates, by using twisted iron bars or rods.

Gessner, Ernst, of Aue, near Schneeburg, Saxony. *Improvements in gig-mills.* Patent dated February 21, 1854. (No. 416.)

In carrying out this invention, two raising cylinders are employed, the axes of which are geared together by cog-wheels. The cloth to be napped or raised passes partly over one, and partly under a second roller, these rollers being pressed towards each other so as to nip the cloth between them.

Smith, James, of Glasgow, Lanark, pattern-weaver. *Improvements in ornamental weaving.* Patent dated February 21, 1854. (No. 417.)

This invention mainly consists in applying to looms used for weaving ornamental fabrics, a series or endless chain of segmental strips of wood, or other suitable material, arranged so as to act on the needle frames, as employed in lappet weaving, by means of grooves or recesses cut upon them in accordance with the pattern.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery for making matches.* (A communication.) Patent dated February 21, 1854. (No. 418.)

This invention consists in the employment of a drum (if wax matches are to be manufactured), round which drum the wax wicks are wound, and then passed along between grooved feeding-rollers and corresponding guide-grooves in fixed tables, until their ends enter suitable holes in a movable dipping-board, on which, by means of knives worked by the machine, they are cut into proper lengths, and thus made ready for dipping into the combustible preparation. A modification of the above arrangement is employed for wooden matches.

Dixon, Adam, of Smethwick, Stafford, engineer. *Improvements in railway axle-boxes and bearing-springs.* Patent dated February 21, 1854. (No. 419.)

*Claims.*—1. The use in railway axle-boxes of three separate bearing-brasses, placed apart from each other round the axle journal. 2. The use in railway axle-boxes of a drawer for supplying the lubricating matter to the journal, such drawer being provided with a self-acting flap for pressing the matter down towards the journal. 3. The use in

railway bearing apparatus of two cylinders arranged to act together as a compound fluid spring.

DIXON, ADAM, of Smethwick, Stafford, engineer. *Improvements in timber scaffolding or stageing.* Patent dated February 21, 1854. (No. 420.)

The inventor claims a mode of connecting together the poles or timbers of scaffolding by means of metal brackets, capable of being clamped or fixed upon the poles by means of screws or wedges.

GOSSAGE, WILLIAM, of Widnes, Lancaster. *Improvements in the manufacture of certain alkaline carbonates, and in the useful application of such carbonates.* Patent dated February 21, 1854. (No. 422.)

The alkaline carbonates, to the manufacture of which these improvements are applicable, are the bi-carbonate and sesqui-carbonate of potash, the bi-carbonate, sesqui-carbonate, and carbonate of soda, and the bi-carbonate and sesqui-carbonate of ammonia; and the main feature of the improvements consists in the employment of a certain described "absorbing tower."

SCHAEFFER, WILLIAM CHARLES THEODOR, of Stanhope-terrace, Hyde-park-gardens, Middlesex, analytical chemist. *An improved mode of recovering the fatty matters contained in waste waters of woollen-mills.* Patent dated February 21, 1854. (No. 423.)

The inventor runs the waste waters into an evaporating-pan or pans, and throws into the liquor, while boiling, ox-fat, lard, or other fat, in suitable quantities for forming a nucleus for drawing together the particles of grease while the water is subjected to violent ebullition. He then throws in potash or soda, and continues the boiling, by which means he obtains a residuum of rough soap.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in fire-arms and in projectiles.* (A communication.) Patent dated February 22, 1854. (No. 424.)

The primary feature of this invention consists in constructing a fire-arm provided with a magazine in the form of a barrel, extending parallel with the bore of the gun, in which magazine or barrel the ball-cartridges are placed one above another, being pressed forward to the breech end of the gun by a piston and strong spring placed in the magazine at the other end.

TAYLOR, EDWARD, of Kinghorn, Fife, heckle-maker. *Improvements in gill-heckles or combs for treating fibrous materials.* Patent dated February 22, 1854. (No. 426.)

*Claim.*—"The system or mode of forming the stocks or holding-pieces of gill-heckles or combs for treating fibrous materials, of brass or other metal, drawn or rolled of a suitable section."

ASSANTI, DAMIANO, of Upper Berkeley-street, Middlesex, gentleman. *A means of rendering porous substances waterproof.* Patent dated February 22, 1854. (No. 427.)

This invention consists in rendering porous substances waterproof, by causing them to imbibe or absorb gutta percha. The gutta percha is dissolved in sulphuret of carbon, or other solvent, and the articles to be waterproofed are plunged in the solution, and allowed to absorb it. The solvent is afterwards evaporated by heat.

MASSEY, EDWARD, of Tysoe-street, Clerkenwell, Middlesex. *Improvements in ships' logs, known as "Massey's Patent Ships' Logs."* Patent dated February 22, 1854. (No. 428.)

In Massey's patent ships' logs considerable inconvenience has heretofore been felt from the liability of the universal joint, by which the rotator is attached to the registering apparatus, to collect weeds and other matters which interfere with the proper action of the log; and these improvements consist mainly in closing or covering in the universal joint by a suitable shield at the front or back part of the apparatus, which shield at the same time permits the free action of the joints, and obviates the objection before referred to.

COLT, SAMUEL, of Spring-gardens, Middlesex, gentleman. *Improved machinery for rifling fire-arms.* (Partly a communication.) Patent dated February 22, 1854. (No. 429.)

In carrying out this invention, the barrels are arranged side by side in the machine, and are each fixed in a hollow axle mounted in suitable fixed bearings. These axles receive an intermittent motion for the purpose of turning the barrels after every successive cut made by the rifling-tools, which traverse to and fro through the barrels, thus bringing up a different surface to the action of the tools.

SPURR, JAMES DE WOLFE, of Kenyon-terrace, Birkenhead. *Improvements in distilling coals and bituminous and resinous substances, and products thereof.* Patent dated February 22, 1854. (No. 430.)

The inventor claims, distilling the above-named substances *in vacuo*.

BOYDELL, JAMES, of Gloucester-crescent, Regent's-park. *Improvements in applying apparatus to carriages to facilitate the draught.* Patent dated February 22, 1854. (No. 431.)

These improvements relate to apparatus patented by the inventor August 29, 1846, and consist in the application of side pieces to each portion of certain moveable rails attached to the running wheels of carriages, so as to obtain a more extended bearing for

the rails whilst the wheel is passing over it; and also to the construction of the parts of the rails by combining rough iron and wood.

SETTLE, THOMAS, of Bolton-le-Moors, Lancaster, spindle-maker, and PETER COOPER, of the same place, flyer-maker. *Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous materials.* Patent dated February 23, 1854. (No. 432.)

"These improvements consist in the application of the principle of the pendulum motion to the flyers employed in slubbing and roving-frames, whereby the pressure of the small lever or 'presser,' which conducts the 'sliver' on to the bobbin, is obtained, instead of employing springs, centrifugal force, or other analogous mechanical pressure, as hitherto employed."

OPPENHEIMER, ADOLPHUS, of Manchester, Lancaster, manufacturer. *Certain improvements in the manufacture of mohair velvet or mohair plush.* Patent dated February 23, 1854. (No. 433.)

This invention consists in manufacturing velvets with a mohair pile woven as weft, and in such manner, that the pile may be cut the length way of the piece.

WALKER, CHARLES, of Bury, Lancaster, engineer. *Improvements in purifying water for steam boilers.* Patent dated February 23, 1854. (No. 436.)

These improvements relate to an apparatus a patent for which was granted 1st December, 1852. In that invention a purifying matter was suspended within the boiler, but the inventor now places this vessel on the outside of the boiler.

PRUDAY, THOMAS DANSON, of Rupert-street, Haymarket, Middlesex, cook. *Improved apparatus for cooling liquids and edible substances.* Patent dated February 23, 1854. No. 437.)

This apparatus consists of two cases, an inner and an outer one, between which ice is to be placed, the substances to be cooled being contained in the inner one.

HUNT, WILLIAM, of Lea Brook Chemical Works, near Wednesbury, manufacturing chemist. *Improvements applicable to the utilizing of ammonia given off in certain manufacturing processes.* Patent dated February 23, 1854. (No. 438.)

As an example of these improvements the inventor places a hood or inverted funnel over the bath of melted zinc, used in galvanizing iron, and causes the vapours collected by it to pass along a flue into a condenser constructed of wood, and filled with coke kept moist by causing dilute muriatic acid or water to percolate through the coke, so as to absorb the muriate of ammonia and the caustic ammonia which arise from the galvanizing operations.

FAIRBAIRN, PETER, of Leeds, York, mechanist. *Certain improvements in machinery for winding slivers of flax, tow, or other vegetable fibrous materials, into laps or balls.* Patent dated February 25, 1854. (No. 441.)

The inventor describes an arrangement of machinery by which, when rotary motion is given to a driving shaft, a train of spur-wheels actuates a disc-plate by means of a friction-plate, and thereby causes a bobbin to rotate in contact with the winding-on drum, but at a superior surface speed, so that when slivers of fibrous material are supplied to the machine in the usual manner, they are wound upon the bobbin; and as the diameter of the lap increases, the drum is forced down, and the pressure of it upon the lap will, to a certain degree, overcome the power communicated to the friction-plate, and cause that plate to slip over the surface of one of the spur-wheels, by which means the speed of the rotation of the lap will be regulated, and the slivers will be tightly wound upon the bobbin.

RYDER, WILLIAM, of Bolton-le-Moors, Lancaster, machinist, and JAMES RYDER, of the same place, agent. *An improved composition applicable to coating metals.* Patent dated February 25, 1854. (No. 442.)

This invention consists in obtaining a fluid composition by mixing gutta percha with resin, tar, pitch, or asphaltum, and dissolving them in impure benzine or coal naphtha, or other volatile hydrocarbons obtained from bituminous shales or schists.

HARDY, SAMUEL LITTLE, of Dublin, M.D. *An improved apparatus for applying chloroform vapours or other similar vapour in certain cases.* Patent dated February 25, 1854. (No. 444.)

*Claim.*—"The combination of a pair of bellows with chambers, through which in succession air may be made to pass and become impregnated with vapours contained therein, and be ultimately discharged therefrom and directed to particular parts of the human body."

COWPER, CHARLES, of Southampton-buildings, Middlesex. *Improvements in furnaces.* (A communication.) Patent dated February 25, 1854. (No. 446.)

A full description of this invention will be given hereafter.

*** The documents of No. 445 are with the Law Officers under objection.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

KING, HENRY, of Gilbert-street, Oxford-street, Middlesex, wholesale perfumer. *An improved mode of signalizing between the guard and driver of a railway train.* Appli-

cation dated February 21, 1854. (No. 410.)

The inventor proposes to blow a whistle by means of bellows, and thus communicate railway signals.

JONES, STOPFORD THOMAS, of Union-court, Old Broad-street, London. *Improvements to reduce and wash minerals to extract metal therefrom, especially gold.* Application dated February 21, 1854. (No. 413.)

The inventor says, "I make a crusher or pulveriser of cast-metal, about three feet in diameter, and about eighteen inches deep, tapering to the top with a hollow neck, but convex underneath, to fit in the concavity of a metal pan. In the neck of the crusher I firmly fix a spindle, which I secure and work through brasses, fastened firmly to a strong iron bar.

VON RATHEN, ANTHONY BERNHARD, Baron, of Wells-street, Middlesex. *Improvements in omnibuses, for the purpose of adapting them to be drawn by one horse, and to be attended by one man only.* Application dated February 21, 1854. (No. 421.)

This invention consists in fixing to the front of the omnibus a platform with steps on both sides, and with doors to allow passengers to enter at the front.

MORISON, JAMES, of Paisley, Renfrew, machinist. *Improvements in celestial and terrestrial globes.* Application dated February 22, 1854. (No. 425.)

A convenient mode of forming globes on the inventor's principle, is that of taking two hemispherical cups, or sheets of India-rubber, and cementing the two sections together to form a complete globe, which can then be inflated or distended by air or liquid.

ROBINSON, THOMAS, of St. Helen's, Lancaster, iron-founder. *Improvements in machinery or apparatus for raising and lowering goods.* Application dated February 23, 1854. (No. 434.)

My improvements consist in the employment of a radial arm or beam, connected at one end to a horizontal shaft, which thus constitutes for it a centre of motion, the other end being provided with a hook-chain, for the purpose of holding goods required to be raised or lowered. The raising and lowering are to be effected by means of a cylinder, piston, piston-rod, rack, toothed-wheel, band, pulley, and a horizontal shaft.

BARLING, JOSEPH, of High-street, Maidstone, Kent. *Improvements in treating the hop-bine, and rendering it applicable to the manufacture of paper and other articles.* Application dated Feb. 23, 1854. (No. 435)

This invention consists in separating the bark of the hop-bine from the woody centre or core, and in treating the former only.

STOY, HUGH, of St. John's-road, Battersea-rise, Surrey, yeoman. *Stopping of engines and carriages on railways, and also vehicles of every description on the common roads.* Application dated February 23, 1854. (No. 439.)

This invention consists in a method of stopping vehicles, in which the driving-wheels are lifted up off the line, then caused to act retardingly upon the other wheels by means of cranks, &c.

FOARD, EDWARD, of Nicholas-street, New North-road, Middlesex. *Improvements in furnaces.* Application dated February 23, 1854. (No. 440.)

These improvements consist in applying a casing or partly enclosed chamber to the front of a furnace, by which air passing through it will become heated.

KINGSBURY, EDWARD, of Knightsbridge, Middlesex, gentleman. *Improvements in apparatus for indicating the rise or fall of water or other liquids in ships' holds, tidal harbours, or other vessels or places.* Application dated February 25, 1854. (No. 443.)

The inventor describes an arrangement, consisting of a vertical rod placed in a tube, and connected at the lower part to a piston, which works in an air-tight cylinder.

## PROVISIONAL PROTECTIONS.

*Dated May* 17, 1854.

1097. Jean Marie Rabier, architect, of Paris, France. Certain improvements in keels of ships and vessels.

*Dated May* 23, 1854.

1147. Louis Emile Dufour, merchant, of Paris, France. Improvements in breech-loading fire-arms.

*Dated June* 26, 1854.

1405. Henri Mantegués, of Rouen, France. Improvements in the manufacture of boots, shoes, goloshes, or in shoe-making generally.

*Dated July* 12, 1854.

1531. William Armand Gilbee, of South-street, London, gentleman. Improvements in the application to weaving of certain textile plants not hitherto employed, either alone or in combination with silk, cotton, and other fibrous substances. A communication.

*Dated July* 21, 1854.

1599. Sir John Scott Lillie, companion of the most honourable Order of the Bath, of Pall Mall, Middlesex. Improvements in fire-arms.

*Dated July* 24, 1854.

1621. Richard Roberts, of Manchester, engineer. Improvements in machinery for punching, drilling, and riveting.

*Dated July* 25, 1854.

1631. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in the process of converting wood into paper. A communication.

*Dated July* 26, 1854.

1649. Constantin Luques, of Boulevart St. Mar-

tin, Paris, France. An improved centrifugal governor.

*Dated July 31, 1854.*

1687. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of extracting sulphur from compounds of India-rubber and sulphur. A communication.

*Dated August 12, 1854.*

1745. Pierre Athanase Regnier, of Paris, France. A new mode of treating and curing varicose veins of the human body. A communication.

*Dated August 16, 1854.*

1780. Edward Mandine, Jean Baptiste, Adolphe Fiette, and Jean François Mermet, all of Bedford-row, Holborn, Middlesex. The conversion of gum into colours.

*Dated August 17, 1854.*

1796. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. Certain improvements in the felting of hats, and in machinery for that purpose. A communication.

1797. John Hackett, of Derby, manufacturer. The manufacture of new and improved fabrics of cotton and of linen, and of cotton and linen combined.

1799. Robert Griffiths, of the Strand. An improvement in the manufacture of brushes.

1801. Louis Christian Koeffler, of Rochdale, Lancaster, bleacher and dyer. Improvements in extracting colouring matter, also applicable for extracting size or glue from animal substances.

*Dated August 18, 1854.*

1803. Edward Tenary, of Stourbridge, Worcester, contractor. A new or improved machine for driving piles.

1806. Joseph Powell Walton, of Barratt-hall, Hertford. Improvements in obtaining impressions from lithographic stones or plates.

1807. John Pretty Clarke, of Leicester, cotton-winder. Improvements in the manufacture of reels for reeling of cotton, linen, thread, silk, or other fibrous material.

1809. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for cutting files and rasps. A communication.

1811. John Carey, of Birmingham, Warwick, corkscrew and steel toy-manufacturer. An improved construction of corkscrew.

1813. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved composition for fixing lithographs and engravings on canvas after being transposed or reproduced by a printing-press. A communication.

1817. Edward Lund, of Manchester, Lancaster, gentleman. Improvements in cocks, valves, water-plugs, and flexible joints.

1819. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in moulding or shaping articles of vulcanized caoutchouc. A communication.

*Dated August 19, 1854.*

1821. William Fox and William Henry Fox, of Compton-street, Middlesex, engineers. Improvements in furnaces to facilitate the combustion of smoke.

1825. Nehemiah Brough, of Birmingham, Warwick, machinist. A new or improved dress-fastening.

1827. James Allan, of North-street, Aberdeen, practical engineer, and James Taylor, of the same place, joiner. Improvements in the construction of rotatory engines.

1829. George Newton Lamb, of St. Helen's, Lancaster, cement-manufacturer. Improvements in the manufacture of Portland cement.

1831. James Worrall, junior, of Salford, Lancaster, dyer and finisher. Improvements in the method of cutting fustians, cotton velvets, and other piled goods or fabrics.

*Dated August 21, 1854.*

1833. Tristram Shandy Simpson, of St. Anne's place, Limehouse, Middlesex, carpenter. Improvements in sashes.

1836. William Henry Smith, M.D., of Philadelphia, United States of America, Henry Bessemer, of Baxter-house, St. Pancras; and Robert Longsdon, of Nursery-lane, engineers. Improvements in the manufacture and treatment of slag and vitreous substances, and the combination of other substances therewith.

1837. John Grist, of Islington, Middlesex, engineer. Improvements in machinery for the manufacture of casks, barrels, and other similar articles.

*Dated August 22, 1854.*

1841. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the manufacture of carding apparatus for the preparation of fibrous materials. A communication.

1845. Robert Benton, of Saltley Hall, Birmingham, surveyor and land-agent. Improvements in marine and railway telegraphs.

1846. William Hunter Meriwether, of Morley's Hotel, Strand. Improvements in producing surfaces for lying, reclining, or sitting upon.

1847. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Certain improvements in carding-engines. A communication.

*Dated August 23, 1854.*

1849. William Shepherd Smith, of Charlotte-street, Fitzroy square, Middlesex, pianoforte-manufacturer. Improvements in pianofortes.

1851. John Norton, of Cork, Esq. An igniter or apparatus for igniting explosive and combustible materials.

1853. Matthew Curtis, of Manchester, Lancaster, machinist; William Henry Rhodes, of Gorton, in the said county, mechanic; and John Wain, of Greenacres Moor, Oldham, in the said county, mechanic. Improvements in certain machines for spinning and doubling cotton and other fibrous substances.

1855. Peter Fairbairn and Thomas Greenwood, both of Leeds, York, machinists. Improvements in machinery for preparing to be spun cotton, wool, flax, silk, and other fibrous materials.

*Dated August 24, 1854.*

1857. Henry Frost, of Sheffield, York, timekeeper to John Johnson Smith, of Roscoe place, Sheffield, stove-grate manufacturer. Improvements in furnaces or fireplaces for steam generators and other purposes.

1859. John Horrocks, of Pilkington, Lancaster, machine-maker. Certain improvements in pin cops, or pin bobbins, or spools for weaving.

1861. Hector Guand de Châteauneuf, of Paris, France, civil engineer. Certain improvements in the process and apparatus for washing.

*Dated August 25, 1854.*

1865. Joseph Henry Tuck, of Pall Mall, Middlesex, engineer. Improvements in packing for pistons, piston-rods, valves, and other uses.

1866. William Woodcock, of the Earl's-court Brewery, Brompton, Middlesex, brewer. An improvement in the construction of furnaces.

*Dated August 26, 1854.*

1871. Henry Bovey, of Kent-street, Southwark, Surrey, builder. Consuming smoke in furnaces.

1873. William Smith and Thomas Phillips, of Snow hill, London. A new mode of constructing and connecting pipes or tubes for gas, water, or steam purposes.

1877. Peter Fairbairn, of Leeds, York, machinist, and Robert Dempster, of Bessbrook, near Newry, Armagh, Ireland, flax-mill manager. Improvements in machinery for carding, drawing, and spinning tow and tow waste.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1904. John Heather, of Bedford-court, Covent-garden, Westminster, surgeon's instrument-maker and cutler, carrying on business under the name of William Blackwell. An invention consisting of sugar-nippers combined with sugar-tongs to be used for the purpose of cutting or breaking lumps of loaf and crystallized sugar, and distributing the same at the tea and breakfast table, to be called "Blackwell's combined sugar-nippers and tongs." August 31, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 12th,* 1854.)

983. Richard Waller. Improvements in valves, applicable to steam engines and other purposes, and in apparatus connected with the same.

995. Eugene Hippolyte Rascol. An improved connection for driving straps, bands, or belts. A communication from Madelle. Maria Convents, of Nancy, France.

1000. Charles Barlow. Improvements in meters for accurately measuring water and other fluids discharged from pipes, sluices, or vessels. A communication from Joseph R. Taylor, of New York.

1003. Henry Stewart. A pocket protector and pocket.

1018. Henry Gregory Drewe. Improvements in obtaining metal from ores.

1019. Richard Waller. Improvements in engines and apparatus, and means of obtaining motive power from liquids, vapours, gases, or air, parts of which invention may be applied also to ordinary steam or other engines.

1026. Carl Pfersdorff. A new toy or aërial top.

1030. George Thomas. Improvements in the construction of the framework of upright pianofortes.

1032. Charles Benjamin Normand. Improved machinery for sawing wood.

1042. Rees Reece. The smelting of iron by means of turf or peat simultaneously with the combustion of the peat and collection of the products therefrom.

1059. Daniel Campbell and James Barlow. Improvements in looms for weaving.

1148. Ernest Radigon and Raimond Gabriel de Grimouville. Certain improvements in glasses, shades, and smoke plates, used in gas and other lighting.

1185. Henry Kraut. Certain apparatus applicable to cocks, taps, and valves.

1194. Auguste Edouard Loradoux Bellford. Improvements in machinery for making bags of paper or other suitable material. A communication.

1205. George Alfred de Penning. An appendage to screw propellers.

1216. Walter Westrup. Improvements in the manufacture of wheat into flour.

1282. Arthur Llewellyn Dawson. Improvements in machinery for cutting and shaping wood.

1351. George R. Chittenden. Improvements in sewing machines. A communication.

1358. Henry Dembinski. Improvements in heating apparatus.

1531. William Armand Gilbee. Improvements in the application to weaving of certain textile plants not hitherto employed, either alone or in combination with silk, cotton, and other fibrous substances. A communication.

1621. Richard Roberts. Improvements in machinery, for punching, drilling and riveting.

1686. Joseph Green and William Jackson. Improvements in mortising machines.

1689. Edward Gillman. Improvements in the manufacture of papier maché and other similar articles from certain vegetable substances.

1705. William Rye and William Crowther. Improvements in steam engines.

1730. Samuel Lucas. An improved mode of manufacturing steel.

1732. Thomas Waterhouse. Improvements in machinery for cutting files. A communication.

1776. Benjamin O'Neale Stratford, Earl of Aldborough. Improvements in projectiles.

1807. John Pretty Clarke. Improvements in the manufacture of reels for reeling of cotton, linen, thread, silk, or other fibrous material.

1827. James Allen and James Taylor. Improvements in the construction of rotatory engines.

1831. James Worrall, junior. Improvements in the method of cutting fustians, cotton velvets, and other piled goods or fabrics.

1842. William Hunter Meriwether. Improvements in the construction of fences and hurdles.

1845. William Hunter Meriwether. Improvements in producing surfaces for lying, reclining, or sitting upon.

1848. Charles Blunt and Joseph John William Watson. An improved description of artificial fuel.

1855. Peter Fairbairn and Thomas Greenwood. Improvements in machinery for preparing to be spun, cotton, wool, flax, silk and other fibrous materials.

1873. William Smith and Thomas Phillips. A new mode of constructing and connecting pipes or tubes for gas, water, or steam purposes.

1877. Peter Fairbairn and Robert Dempster. Improvements in machinery for carding, drawing, and spinning tow and tow waste.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed September* 8, 1854.

551. Richard Boyell.
574. Simeon Mosely.
613. James Woodford.
657. Joseph Horton and Richard Jenkin Polglase.
697. Edward Bagot.
745. Frederick Samson Thomas.
835. Louis Marie Trouble.
1031. Théodore Lemielle.
1167. Louis Michel François Doyere.
1181. James Murdoch.
1357. Henry Vernon Physick.
1489. James Edward M'Connell.

*Sealed September* 12, 1854.

598. Lawrence Whitaker, John Diggle and George Howarth.

617. Thomas Kaye.
620. Lawrence Whitaker and Greenwood Lyons.
627. Miles Binns and John Pollard.
629. Robert Weare.
641. George Harman Barth.
644. George Waide Reynolds.
661. Joseph Perkins.
674. George Sterry.
725. Jean François Lucevilliard.
763. Giuseppe Devincenzi.
777. John Hamilton Glassford.
792. Joseph Nash.
841. William Lewis Baker.
913. William Johnson.
929. Robert Galloway.
935. Moses Poole.
1043. William Williams.
1186. John Evans.
1420. Peter Armand Lecomte de Fontainemoreau.
1438. John M'Gaffin.
1440. John Henry Johnson.
1452. William Balk.
1512. George Arthur Biddell.
1524. Oliver Maggs.
1550. John M'Gaffin.
1576. Richard Hornsby.
1577. Auguste Edouard Loradoux Bellford.
1607. Auguste Edouard Loradoux Bellford.
1671. Peter George Harris.
1673. Edmund Burke.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*Charles Murray.*—The expedient proposed by you for the prevention of boiler explosions has already been adopted under various modifications. We believe it has been found to answer satisfactorily.

*J. M.*—Yours received with thanks.

*George Bower.*—Your communication shall receive our attention.

*A Mechanic* —The process usually followed by the potato sugar makers is to mix 100 gallons of boiling water with every 112 lbs. of the fecula and 2 lbs. of the strongest sulphuric acid. This mixture is boiled for about 12 hours in a large vat, made of white deal, having lead pipes laid along its bottom, which are connected with a high pressure boiler. After being thus saccharified, the acid liquor is neutralized with chalk, filtered and then evaporated to the density of about 1·300 at the boiling temperature, or exactly 1·342 when cooled to 60°. When syrup of this density is left in repose for some days, it concretes altogether into crystalline tufts, and forms an apparently dry solid, of specific gravity 1·39.

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1624.] SATURDAY, SEPTEMBER 23, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## LILLEY'S PATENT MACHINERY FOR OBTAINING FIBRES FROM THE PLANTAIN AND BANANA.

Fig. 2.

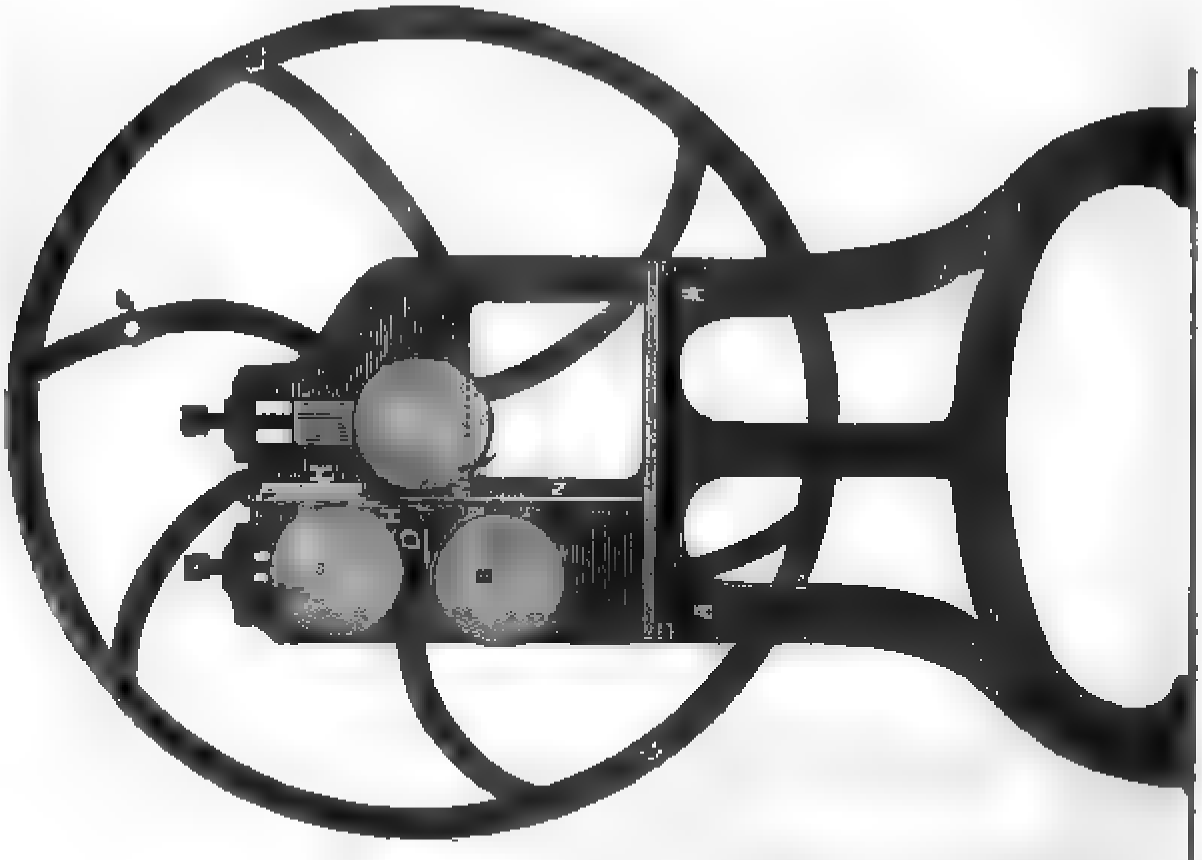
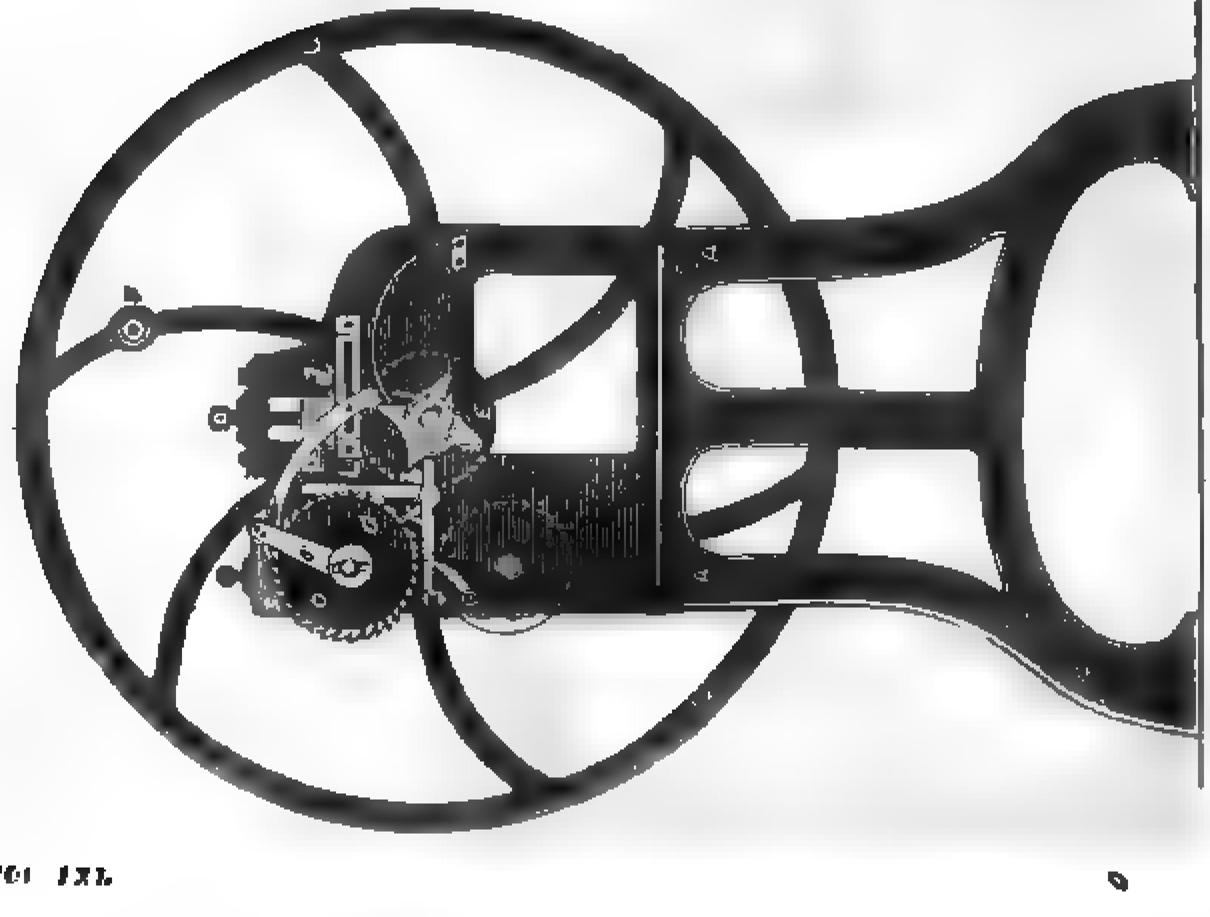


Fig. 1.



## LILLEY'S PATENT MACHINERY FOR OBTAINING FIBRES FROM THE PLANTAIN AND BANANA.

(Patent dated March 15, 1854.)

Mr. Lilley's invention consists in obtaining a material suitable for spinning, and for the manufacture of pulp for paper-makers, from the heart or core of the plantain, banana, and other plants of the same species. The machinery by which this is effected is represented in the accompanying engravings. Fig. 1 is a side elevation, fig. 2 a cross section, and fig. 3 a back view of the machine. Fig. 4 shows some of the working parts detached and on a larger scale.

AA is the framework. BB are the feed rollers mounted in suitable brasses in the framework, and connected together by a pair of spur-wheels, CC, keyed upon their shafts, and gearing into each other. D is a guide-plate placed horizontally across the machine, and partially between the feed-rollers, which serves to carry the leaves or other parts of the plants to be operated upon by the roller, E. This roller is also mounted in the framework, and has fixed upon its circumference, in four or more sets or rows, teeth or gills of the shape represented in fig. 2, by means of which the plants are cut into strips or shreds of equal width, or nearly so. The roller, E, is caused to revolve by the handle, F, fixed to one of the arms of the fly-wheel, G, keyed upon the spindle of the roller. H is a doffing knife, which is attached by countersunk screws to a frame, H′, free to move up and down in slots in the framework, A, when operated upon in the following manner:—I is a cam-wheel with four arms, one arm to each row of teeth, which is keyed upon the spindle of the roller, and revolves with it. A similar wheel is mounted upon the opposite end of the roller. These cam wheels in their revolution act upon one end of levers, K, having their

Fig. 3.

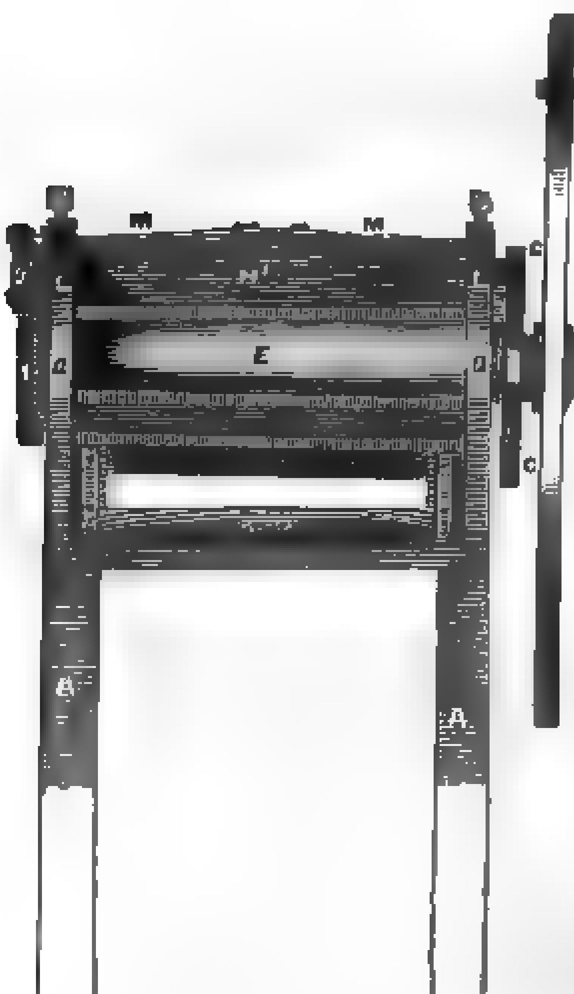
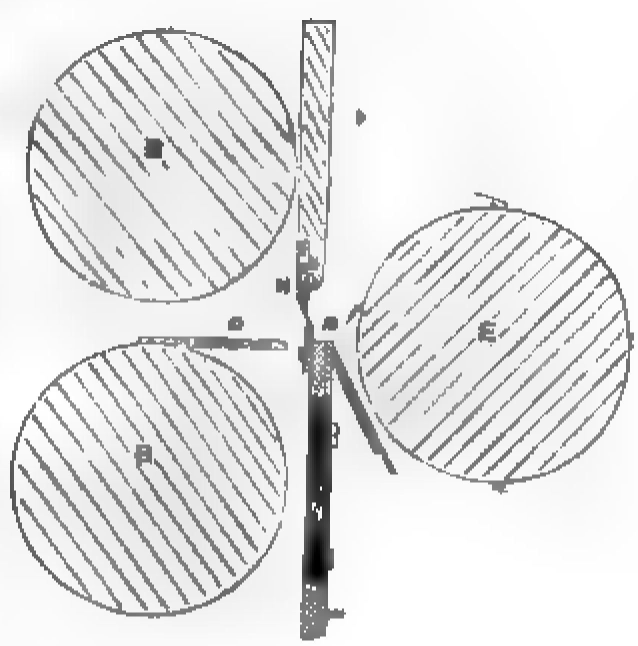


Fig. 4.



fulcra at *a*. L are rods attached to the levers K at *b*. These levers have formed in them, at their upper ends, an eye, which fits over small stud-pins, projecting from each end of the frame, H′, of the doffer knife, H. It will be seen that upon the revolution of the roller, E, the arms of the cam-wheel, I, alternately come in contact with the levers, K, and thereby depress them, and at the same time, by means of the rods, L, the doffing knife is brought down upon the portions of the plants under operation. After each stroke of the doffer-

knife, and when the levers, K, are released from the cam-wheels, the doffer-knife and frame are drawn up by the action of the spring, M, which is secured by screws to the top part of the frame, H′, the ends thereof bearing upon the framing, A. N is the nipper screwed to the framing, N′, which has a similar reciprocating motion imparted to it, or it may remain stationary. The action of this doffer and nipper is to denude the leaves and other parts of the plants above mentioned of their fibrous and pulpy matters in their passage between them. O is a ratchet-wheel upon the spindle of the top feeding-roller, into the teeth of which the pall, *c*, takes. This pall is centred in the end of the lever, O′. P is a curved rod attached to the lever, O′, and furnished with a stud pin, which travels in a slot in the plate, *d*, screwed to the framework. Q is a spring which bears against the end of the rod, P, and keeps it in contact with the cam-wheel, I, the action of which is, in its revolution, to bring the arms alternately against the rod, P, and thereby to press it forward, and by means of the pall, *c*, to cause the ratchet-wheel to revolve, and with it the top feed-roller, which, through the spur-gearing, C C, gives motion to the lower feed-roller, and thus the feed is regulated by the motion of the roller, E. The fibrous pulpy material, after being thus separated from the heart or core of these several plants, is then fit for being carded or otherwise treated previously to spinning on cotton, silk, and woollen spinning machinery; or it may be reduced to a pulp for manufacturing into paper or other similar materials by the processes ordinarily followed for such purposes.

## OBSERVATIONS ON A TELEGRAPH LINE BETWEEN EUROPE AND AMERICA.

BY L. TURNBULL, M.D.

THE magnificent idea of connecting Great Britain and the United States by telegraph, which has long been a favourite one with me, has been again revived in this country, and received much strength and encouragement from the investigations of the depths and condition of the bottom of the ocean, along the route of the merchantmen between Europe and the United States. According to a recent letter of Lieutenant Maury's to the Secretary of the Navy, dated February 22, 1854, Lieutenant Berryman availed himself of this opportunity to carry a line of deep-sea soundings from the shores of Newfoundland to those of the Irish coast:

"The result is highly interesting, as it bears directly, in so far as the bottom of the sea is concerned, upon the question of a submarine telegraph across the Atlantic, and I therefore beg leave to make it the subject of a special report.

"This line of deep-sea soundings seems to be decisive of the question as to the practicability of a submarine telegraph between the two continents, *in so far as the bottom of the sea is concerned.*

"From Newfoundland to Ireland, the distance between the nearest point is about 1,600 miles;* and the bottom of the sea between the two places is a plateau, which seems to have been placed there especially for the purpose of holding the wires of a submarine telegraph, and of keeping them out of harm's way. It is neither too deep nor too shallow; yet it is so deep that the wires, but once laid, will remain for ever beyond the reach of vessels' anchors, icebergs, and drifts of any kind; and so shallow that the wires may be readily lodged upon the bottom.

"The depth of this plateau is quite regular, gradually increasing from the shores of Newfoundland to the depth of from 1,500 to 2,000 fathoms, as you approach the other side.

"The distance between Ireland and Cape St. Charles, or Cape St. Lewis, in Labrador, is somewhat less than the distance from any point of Ireland to the nearest point of Newfoundland.

"But whether it would be better to lead the wires from Newfoundland or Labrador, is not now the question; nor do I pretend to consider the question as to the possibility of finding a time calm enough, the sea smooth enough, a wire long enough, a ship big enough, to lay a coil of wire 1,000 miles in length; though I have no fear but that the enterprise and ingenuity of the age, whenever called on with these problems, will be ready with satisfactory and practical solutions of them.

"I simply address myself at this time to the question in so far as the *bottom of the sea* is concerned, and as far as that, the greatest practical difficulties will, I apprehend, be found after reaching soundings at either end of the line, and not in the deep sea.

"I submit herewith a chart showing the depth of the Atlantic according to the deep sea soundings made, from time to time, on

* From Cape Freels, Newfoundland, to Erris Head, Ireland, the distance is 1,611 miles; from Cape Charles or Cape St. Lewis, Labrador, to ditto, the distance is 1,601 miles.

board of vessels of the navy, by authority of the department, and according to instructions issued by the chief of the Bureau of Ordnance and Hydrography. This chart is plate XIV. of the sixth edition of Maury's Sailing Directions.

"By an examination of it, it will be perceived that we have acquired by these simple means a pretty good idea as to the depression below the sea-level of that portion of the solid crust of our planet which underlies the Atlantic Ocean, and constitutes the basin that holds its waters.

"A wire laid across from either of the above-named places on this side, will pass to the north of the Grand Banks, and rest on that beautiful plateau to which I have alluded, and where the waters of the sea appear to be as quiet and as completely at rest as it is at the bottom of a mill-pond.

"It is proper that the reasons should be stated for the inference that there are no perceptible currents, and no abrading agents at work at the bottom of the sea upon this telegraphic plateau.

"I derive this inference from a study of physical fact, which I little deemed, when I sought it, had any such bearings.

"It is unnecessary to speak on this occasion of the germs which physical facts, even apparently the most trifling, are often found to contain.

"Lieut. Berryman brought up with Brook's deep-sea sounding apparatus, specimens of the bottom from this plateau.

"I sent them to Professor Baily, of West Point, for examination under his microscope. This he kindly gave, and that eminent microscopist was quite as much surprised to find, as I was to learn, that all these specimens of deep-sea soundings are filled with microscopic shells; to use his own words, '*not a particle of sand or gravel exists in them.*'

"These little shells, therefore, suggest the fact that there are no currents at the bottom of the sea whence they came—that Brook's lead found them where they were deposited in their burial place after they had lived and died on the surface, and by gradually sinking where lodged on the bottom.

"Had there been currents at the bottom, these would have swept and abraded and mingled with these microscopic remains, the debris of the bottom of the sea, such as oaze, sand, gravel, and other matter; but not a particle of sand or gravel was found among them. Hence the inference that these depths of the sea are not disturbed either by waves or currents.

"Consequently, a telegraphic wire once laid there, there it would remain as completely beyond the reach of accident as it would be if buried in air-tight cases. Therefore, so far as the bottom of the deep-sea between Newfoundland or the North Cape, at the mouth of the St. Lawrence and Ireland is concerned, the practicability of a submarine telegraph across the Atlantic is proved.

"The present state of Europe invests the subject of a line of telegraph wires across the Atlantic with a high degree of interest to the government and people of the United States. A general European war seems now almost inevitable; the attitude which this Government will assume with regard to all the belligerent powers that may be involved in that war, is that of strict, impartial neutrality.

"The better to enable this Government to maintain that position, and the people of the United States to avail themselves of all the advantages of such a position, a line of daily telegraph communication with Europe would be of incalculable service.

"In this view of the subject, and for the purpose of hastening the completion of such a line, I take the liberty of suggesting for your consideration the propriety of an offer from the proper source, of a prize, to the company through whose telegraphic wire the first message shall be passed across the Atlantic."

From the above interesting and instructive letter, the following points are to be decided by the telegraphic engineer:

1st. "To find a time calm enough, and a sea smooth enough to lay down a telegraphic cable." In my own mind, this first difficulty can be overcome as easily as the observations of Lieutenant Berryman were made. If times of calm are found for such careful observations as he has made, by means of a twine string, so as to let down a cannon ball of sixty-four pounds, and then raise a tube filled with the shells and earth of the depths of the ocean; we are almost certain a time calm enough, and a smooth sea, can be found to stretch a wire cable from land to land.

The second difficulty is, "a wire long enough." On this point we have accurate data to follow. The cable from Calais to Dover is 24 miles long, and consists of 4 copper wires, through which the electric currents pass, insulated by coverings of gutta percha. These are formed into a strand, and bound round with spun yarn, forming a core or centre, around which are laid ten iron galvanized wires of $\frac{5}{16}$ths of an inch in diameter, each welded into one length of 24½ miles, and weighing about 15 tons per mile. The rope weighs altogether about 180 tons. It formed a coil of 30 feet diameter outside, 15 feet inside, and 5 feet high, and was made in the short space of 20

days by a machine invented by Mr. George Fenwick, an engineer of the Leaham Harbour Iron Works, in Durham.

The transatlantic cable, if the machinery is multiplied, and 16 machines are employed, could, we have little doubt, complete the cable in six or seven months.

The third difficulty is, "a ship big enough." This can be no difficulty; for if one would not do, surely twenty would. What is the objection to sending it by trips or in pieces? Could it not be attached, as it was laid down, to a *buoy?* A vessel of 1,000 tons could surely carry 400 tons of coil, for our cable would not exceed 12,000 tons.

Another important matter to be determined is, to what extent a galvanic current can be sent on an insulated wire. This has also been determined; for in favourable states of the atmosphere, lines in this country have been so insulated, as to work in one circuit from 800 to 1,000 miles.

In my work on the Telegraph, p. 152, I there state, that the greatest distance that any of the lines had worked in one circuit, was from Boston to Montreal, *via* New York, Buffalo, and Toronto; a distance of about 1,500 miles. This was done when the earth was frozen and the lines insulated by frost.

The entire length of the telegraph line from New York to New Orleans, *via* Charleston, Savannah, and Mobile, is 1,966 miles, and even this distance has been worked as one circuit by the aid of an instrument termed a connector, the effect of which is to cause one circuit to work the other through the entire series, thus producing a result similar to working through the entire line in one circuit.

As late as December 3, 1853, despatches were written direct through from New Orleans to Philadelphia and New York, on the National Telegraph line, the weather being cold and the earth frozen. In doing so the only connector or repeater used was an insulated screw on the back of the register, invented by a distinguished telegraphic engineer, W. C. M'Rea, of this city, which is now the simplest mode employed; but this distance would require at least 30 Grove's cups, of a pint each, for every 100 miles, making about 480 cups, or 240 each side. I think this number of the battery of Mr. C. T. Chester * would be amply sufficient. If a copper and zinc battery were employed, the number would have to be increased to about 30 to 40 cups every hundred miles; but even with this large battery the expenses would be less than with the Grove's battery. In preparing the batteries, it is even possible to determine mathematically beforehand the amount of resistance and the force necessary to overcome it, and thus to proportion the number and size of the plates to the distance to which the wires extend. Large wires are better conductors than small ones. Copper is a much better conductor than iron; and as a thinner wire answers the purpose of conduction, it may be much more easily insulated.

The several conditions may all be calculated from the beautiful formula of Ohm.

In some recent experiments of Professor Faraday, that distinguished philosopher, by some of the results he obtained, has thrown much light upon the action of voltaic electricity in the submerged wire of electric telegraphs.

He first determines by actual experiment, that when copper wire is perfectly covered with gutta percha, so high is the insulation, that in 100 miles of such wire, when fully charged by an intensity battery of 350 pairs of plates, and submerged in water, the deflection of a delicate galvanometer was not more than 5°. The great perfection in the covering of the wire may be judged of by this fact alone. The 100 miles of wire was 1-16th of an inch diameter; the covered wire was 4-16th; the gutta percha on the metal was considered as 0·1 of an inch in thickness. There could not be any better proof than this, that gutta percha is one of the best insulating agents we have, which fact I have before stated in my work on the Telegraph. He experimented with the subterraneous wires, which exist between London and Manchester, and when they were all connected together so as to make one series, they made almost the distance as determined by Lieutenants Berryman and Maury between the Irish coast and Newfoundland, being 1,500 miles, and having introduced galvanometers at intervals of about 400 miles, he found that when the whole 1,500 miles were included, it required *two seconds* for the electric stream to reach the last instrument, which was placed at the end. In this instance the insulation was not as perfect; still the result shows that it will require a little over two seconds to cross the Atlantic by telegraph, which is about the rate of 750 miles in a second, which result is far below those obtained by the London and Brussels telegraph, which is stated at only 2,700 miles in a second, even with a copper wire, while it will be remembered that Wheatstone, in 1834, with copper wire, made the velocity of the electric current 288,000 miles per second, a considerable difference.

The whole of this difference, according to Professor Faraday, depends upon the

* For description of this form of Battery, see page 294.

lateral induction of the wire carrying the current. "The production of a polarized state of the particles of neighbouring matters by an excited body, constitutes *induction*, and this arises from its action upon the particles in immediate contact with it, which again act upon those contiguous to them, and thus the forces are transferred to a distance. If the induction remain undiminished, then perfect insulation is the consequence; and the higher the polarized condition which the particles can acquire or maintain, the higher is the intensity which may be given to the acting forces. In a word, insulators may be said to be bodies whose particles can retain the polarized state; whilst conductors are those whose particles cannot be permanently polarized." And in regard to long circuits, such as those described, their conducting power cannot be understood, whilst no reference is made to their lateral static induction or to the conditions of intensity and quantity which then come into play.

The conducting power of the air and water wires are alike for a constant current. This, according to Faraday, is in perfect accordance with the principles and with the definite character of the electric force, whether in the static, or current, or transition state. When a voltaic current of a certain intensity is sent into a long water wire, connected at the further extremity with the earth, part of the force is in the first instance occupied in raising a lateral induction round the wire, ultimately equal in intensity at the near end, to the intensity of the battery stream, and decreasing gradually to the earth end.

In the report of Professor Faraday, which is given in the *Lon. Phil. Mag.* for March, he there in conclusion refers to the terms *intensity* and *quantity*. These terms, he remarks, or equivalents for them, cannot be dispensed with by those who study both the static and dynamic relations of electricity. Every current where there is resistance, has the static element and induction involved in it, whilst every case of insulation has more or less of the dynamic element and conduction; and we have seen that the same voltaic source, the same current in the same length of the same wire, gives a different result, as the intensity is made to vary with variations of the induction around the wire. The idea of intensity, or the power of overcoming resistance, is as necessary to that of electricity, either static or current, as the idea of pressure is to steam in a boiler, or to air passing through apertures or tubes; and we must have language competent to express these conditions and these ideas.

In conclusion, I trust that a cable may be laid across the briny deep, and I am happy to find the matter taken hold of by intelligent and scientific telegraphic engineers, and its completion will be one of the wonders of the age. I have been recently informed that a company has been organized, styled the New York, Newfoundland, and London Telegraph Company, whose object is the establishment of a sub-marine telegraph to connect Newfoundland with Ireland. Peter Cooper, Esq., a telegraph-wire merchant, of New York, is the president, and Professor S. F. B. Morse is the vice-president, with a number of directors. One of the most active is Tal. P. Shaffner, Esq., a gentleman who has had considerable experience in submarine telegraph lines during the past five years, and who employed the following language in regard to the enterprise in the first number of a Journal of which he is editor: "Tides may ebb and flow; the billows may surge with mighty power; the icebergs may tower their white mantled forms high in the skies, and sink deep in the briny sea; the heavens may let loose the loud-rolling thunder, and the earth heave up its fiery lava; but just as sure as these elements of nature exist, and worlds revolve, America and Europe will be connected by an electric cord."

## CHESTER'S TELEGRAPH BATTERY.

THE *Franklin Journal* gives the following description of this battery, to which reference is made in the preceding article.

This battery, while it does away entirely with local action, employs the cheapest materials and the most convenient arrangement of parts. Its cells are large, of strong glass, and they are insulated from the shelves by a partial coating with electrophorous. Its metals are amalgamated zinc and a peculiar platinized and peculiarly insulated plate, the result of much study and experiment. The plates are supported by metal clamps and thoroughly insulated wood. The construction is such as to secure perfectly against any cross-fire. The plates can be removed and cleaned separately, without stopping the working of the battery. The solution used to excite it is a dilute sulphuric acid. How free it is from local action may be inferred from the fact, that it has been in constant use for five months without being taken down, and that the zincs last such an unprecedented time. The relative cost of working these three batteries, without taking local action into consideration, supposing each equally free from local waste, is as follows; and the estimate is made up from actual experi-

ment, by computing the destruction of battery material in each, necessary to accomplish a given equal amount of work—say the deposition of a pound of silver in the decomposition trough. To accomplish this,

Grove's consumes—

| | |
|---|---|
| 1½ pounds nitric acid, at 12c. . | 18 cents. |
| 1¼ pounds zinc, at 10c. . . . | 12½ „ |
| 1 pound sulphuric acid . . . | 2 „ |
| | 32½ |

Daniell's consumes—

| | |
|---|---|
| 4 pounds sulphate copper, at 11c. | 44 cents. |
| 1½ pounds zinc . . . . . . . | 15 „ |
| 1 pound sulphuric acid . . . | 2 „ |
| | 61 cents. |

The new battery—

| | |
|---|---|
| 1½ pounds zinc . . . . . . . | 15 cents. |
| 3 pounds sulphuric acid . . . | 6 „ |
| | 21 cents. |

## ON AN IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL.

BY M. AUGUSTE LAUGEL.

SCIENTIFIC revolutions are always caused by the discovery of some entirely new principle; industrial ones, by a new and happy application of principles long known, but from which all the results have not yet been obtained.

I propose in this brief memoir to demonstrate the possibility of an industrial revolution in the United States with regard to the manufacture of cast-iron, iron, and steel.

A few historical considerations must first be presented. It is universally known that iron was at first manufactured exclusively by means of charcoal, with apparatus of small dimensions. This method precluded the preparation of large quantities, and it became quite insufficient when the introduction of steam engines gave to industry so much wider a field. The immense importance of coal began to be recognised, and iron was manufactured by its means, according to new methods, which favoured its more rapid production in greater quantities.

A rivalry thus commenced between the coal foundries and those kept up by wood, in which the latter were evidently to be overcome. The nations possessing great coal districts, particularly Great Britain, became the producers of iron for all the rest.

In these circumstances, if suddenly there should be discovered a new means of making iron with wood as rapidly and as economically as it is done at present with coal; if besides, the iron thus prepared should offer in quality very great advantages in comparison with that made with coal, is it not natural to suppose that the consumers, who are only attracted by the cheapness of English iron, would cease to employ it? Even admitting that under certain circumstances this iron would be dearer, they could more advantageously use it for those purposes for which iron of the first quality is indispensable, such as the manufacture of steel.

The country best situated for the success of this industrial revolution is, undoubtedly, the United States of America. For example, wood is found there in great quantities, and may, in some places, be obtained at a very low price; on the other hand, the beds of mineral iron are very numerous: modes of transport, always important in the working of iron, exist in great numbers; here we find all the conditions necessary to success. It remains only to establish with certainty the advantage of this new method of manufacturing iron, and to explain its high importance.

1st. Wood is not charged with those mineral substances which injure at once the calorific effect, and the quality of the metals fabricated by it. Coal contains often 10 per cent. of matters either useless or injurious. Wood, on the contrary, contains hardly one-half per cent. of mineral substances, which besides are never injurious. All wood has great chemical uniformity, while coals differ much from each other, which involves the disagreeable necessity of ranging the methods of employing them. It is well known to metallurgists that wood should not be employed as a combustible without previous preparation, on account of the large proportion of water which it contains.

For many years, the most various experiments have been made to prepare the wood before using it as a combustible. The method to which we would now call attention, has been used for a very short time in Styria and Carinthia, which consists in taking from the wood only the water, and stopping the distillation as soon as the substances which escape begin to contain carbon. Two methods have been used to effect this conversion of wood into *ligneux* (lignum).

1st. The gases coming from the fireplace are brought into immediate contact with the wood; thus the wood is raised to a temperature above 100° Centigrade, which

favours still more the vaporization by the tendency the gases themselves have to be saturated with vapour.*

In the second method only the heat radiating from the gases in the fire-place is employed. These gases are not brought into immediate contact with the wood, but are conducted in pipes of cast or sheet-iron around which the wood is piled.

This second method affords by far the most satisfactory results, being the more economical, and avoiding the disadvantage which sometimes attends the first, of making the *ligneux* pyrophoric, and thereby liable to spontaneous combustion on exposure to the air.

It is important to render the second method still more perfect; the following means might be advantageously employed; the combustion of the wood employed effects the conversion into *ligneux*, which is thus raised to a temperature of 150° Centigrade. All the water contained in this wood escapes in vapour; but the heat contained in this vapour and in the *ligneux* should be made useful, as well as the latent heat contained in the vapour. For this three successive chambers will be necessary; the wood loaded on wagons passes in succession from one chamber to another: in the first chamber the wood will begin to be heated and to dry by means of the latent heat of the vapour, disengaged in the second, and condensed in the third, and also by means of the latent heat of the air cooled in the third and brought back to the first. It is in the second chamber that the entire conversion of the wood into *ligneux* takes place. The *ligneux* will pass into the third chamber to cool; the heated air will be conducted to the first chamber to heat another load of wood; the vapour which is found there, and which comes overheated from the second chamber, will be condensed, and thus will give more heat to the first chamber, with which it communicates by pipes.

In following the preceding method it is possible to change 10 parts of wood (standing for 1·00 of *ligneux*, 0·40 of water) into *ligneux*, by means of one part of wood employed as a combustible.

There is another method more economical which might be employed to convert the wood into *ligneux*: it consists in utilizing the wasted flame of the metallurgic apparatus, after having of course previously used it for other purposes; for example, heating the cauldrons, because, on coming from the apparatus, the gas is of too high a temperature for the operation in question, and is still sufficiently hot after having been employed for the previous processes. But this method, by which economy is carried to the utmost extent, though very suitable in France or Germany, does not seem necessary in America, on account of the cheapness of the vegetable combustible. Thus far we have only explained, and very briefly, the first part of the new method of manufacturing iron. We now come to the second part, which is the *puddling process* with *ligneux;* the puddling, it is well known, is effected by burning in a reverberatory furnace the combustible gases which come from a lateral fire-place: the important part of the operation is, to conduct into the furnace a sufficient quantity of air, to produce a total combustion of the gaseous substances. Generally, too much air is admitted, which has the disadvantage of uselessly absorbing the heat. Mineral combustibles are much better adapted than wood to the operations of the puddling furnace on account of their superior density; they develop a greater quantity of heat and also produce a more regular current of gas; besides which, the interstices between the pieces of wood permit too much air to pass. In the new puddling process, the quantity of air introduced into the furnace is, so to speak, mathematically regulated: the combustible mixture and the current of air which serves to ignite it, are admitted separately into the laboratory: here, the fire-place must be of entirely different dimensions. It is very long vertically, the grate is very low, and composed only of a few bars to support the wood: the air no longer enters freely into the fire-place; the bellows send a graduated current of air under the wood, which traverses it, producing its distillation. On account of the pile which the air is obliged to traverse, this distillation takes place, so to speak, in a gradual and progressive manner: the air thus admitted into the lower part, is in proportion to the quantity of *ligneux* required to be carbonized in a given time. The current of combustible gas which is found in the pile of wood passes into the laboratory, where the puddling takes place, and is met by a current of air carefully regulated and driven through a pipe; thus the laboratory obtains, instead of an ordinary flame, a combustible gas free from all traces of pure oxygen. Nothing is more easy, when one understands the composition of *ligneux*, than to know the exact quantity of air to admit into the furnace. But in what proportion shall the whole amount of this quantity be divided? How much shall go to the furnace and how much to the laboratory? This is a question which experience alone can answer. We can only say in general, that the latter proportion

* It is unnecessary in this memoir to describe either the chamber in which this process takes place, or the requisite apparatus and details of the different processes.

depends upon the more or less combustibility of the mixture of gases, and consequently on the temperature required in the furnace, the rapidity of the distillation, and the operation itself.

This last term has evidently in all cases a limit, which fixes the proportion to be established between these two currents of air. Registers also connect them with each other, which can be managed by the workmen themselves. This mode of combustion is very remarkable, both theoretically and practically; it produces a very great regularity in the labour, and gives a current of very pure gas: the purification of the cast-iron is thus effected under the most favourable circumstances, and even very impure kinds give excellent iron. It is quite otherwise, it is well known, with the ordinary method of puddling with coal, and we may assert in general, that the impurity of iron is attributable less to the cast-iron than to the imperfection of the mode of reviving. In the United States the cast-iron made with wood or anthracite, would never be of a very bad quality,* the admirable perfection of the puddling with *ligneux* would warrant the excellence of the products of the new method. It now remains, and this is the main point, to consider the economical conditions of the question.

The following are the facts of the case, the exactitude of which we will warrant.

The consumption of cast-iron, labour, and *ligneux*, are per ton of iron:

| | | | | |
|---|---|---|---|---|
| | Cast iron ... . ........... | tons | 1·242 | |
| Labour | For the puddling .. ...... | days | 3·85 | 11·25 |
| | For forging and rolling | ,, | 4·60 | |
| | Sundry processes........ | ,, | 2·80 | |
| Ligneux | For the puddling... ..... | tons | 1·20 | 2·50 |
| | For forging and rolling | ,, | 1·30 | |

This estimate may serve to establish the *special* expenses in each particular case: in order to establish the *general* expenses, it will be necessary to obtain information on the following points:

1st. The purchase of land.

2nd. The price of building materials, stones, bricks, clay, etc., etc.

It will be important, in order to diminish as much as possible the total amount, to choose a situation where wood is cheap and abundant, and in the neighbourhood of the mines, from whence the ore could be brought at a small expense. (In case it should be preferable *not* to manufacture the cast-iron, this last observation applies to the cast-iron which it would be necessary to buy.) It is also important to take into account the means of transport of the produce, to the great industrial markets, by canal or railroad; the price of labour, etc., etc.

It would be well perhaps to annex to the establishment, a manufactory of cast-steel; the *ligneux* would be very suitable for this species of manufacture; and it would be very easy to prepare for this purpose, iron of the best quality. The establishment of the works required by this new method, must be on a very large scale; its success depends almost entirely on the employment of the most economical means of manufacturing *ligneux*; this condition can only be fulfilled by preparing the ligneux in great quantities, and consequently the metallurgic apparatus must be very numerous.

The solution of this problem, which we have been examining, is in the highest degree important to the future progress of industry in the United States. It will enable them to employ to advantage the mineral wealth scattered over their territory, and upon a point of the utmost consequence, will render them independent of other nations. It therefore eminently deserves the attention of the metallurgist and the manufacturer.—*Franklin Journal.*

* It remains to be seen, perhaps, if it would not be advantageous to manufacture the cast-iron also with ligneux.

## THE ALKALI MANUFACTURE.

BY ALEXANDER GEORGE GRAY, JUN.

The country between Berwick and Newcastle is one of the greatest manufacturing districts in England, and, for smoke, and smut, and gloom, Pittsburgh and Wheeling, in the United states, bear no comparison to it. The English sky, always paler and cooler in its tints than that of the United States, here seems to be turned into a leaden canopy; tall chimnies belch forth gloom and confusion; houses, factories, fences, even trees and grass, look grim and sooty. The metal *sodium*, which, combined with oxygen, constitutes soda, was discovered by Sir Humphrey Davy, in 1807. The nitre of Scripture is supposed to have been impure carbonate of soda; but this surmise is not universally received. The nitre of the moderns is a different substance altogether, being nitrate of potass, or saltpetre. There are many proofs that carbonate of soda and the nitre of the ancients are identical, and at the present time its usefulness is begun to be felt over the whole civilized world. The period of the French Revolution, among its other effects, is responsible for having "put a stop to all means of obtaining soda." Soda is most largely used in the manufacture of glass and of soap; and in both processes potass may be substituted at a pinch. The French Republic found, however, that every particle of potass was

now required in another manufacture—that of gunpowder — and soap and glass were likely to go unmade. The Committee of Public Safety invited the counsels of all good citizens; and Napoleon appealed, not to their patriotism only, but to their pockets; for he offered a large reward for the simplest and cheapest method of making soda. Several suggestions were sent in—Leblanc's was adopted. His plan was to convert common salt into sulphate of soda, and then to convert the sulphate into carbonate; and such, essentially, is the process pursued to this day. Leblanc, however, never received the reward of his ingenuity. The Bourbons were restored, and the discoverer was neglected. By Leblanc's process the manufacture of sulphuric acid has become the foundation of the manufacture of soda. Sulphuric acid is obtained by oxidizing sulphur to its utmost extent. When sulphur is burnt in air, the product is sulphurous acid:—when burnt in oxygen, sulphuric acid. Sulphuric acid is obtained by our manufacturers by burning sulphur in common air along with some substance which gives off oxygen. The sulphurous acid and the oxygen are conveyed into leaden chambers, and condensed by means of steam. The sulphuric acid forms like dew upon the sides of the chambers, trickles down, and is drawn off at the bottom for use. The substance burnt with the sulphur was at first nitrate of potass or saltpetre, but nitrate of soda has since been substituted. To such a state of perfection has the manufacture of sulphuric acid been brought, that whereas in theory 100 lbs. of sulphur ought to produce 306 lbs. of sulphuric acid, the manufacturer does actually obtain 300. From the leaden chambers the acid is conducted by leaden pipes to concentrating pans; which also, for ordinary purposes, consist of lead; but when it is required that the acid shall be very highly concentrated, vats and stills made of platinum are used. Ordinarily it is boiled down in leaden pans, and run into a decomposing pan containing common salt. This substance consists of chlorine and sodium. The oxygen of the water converts the sodium into soda. The sulphuric acid, uniting with the soda, forms sulphate of soda—the hydrogen and chlorine passing off as muriatic acid gas, the foe of our fields. To banish this unpopular product to the upper air, long chimnies were erected, that of the Friers Goose Works, being 69 feet higher than the topmost pinnacle of St. Nicholas's church, Newcastle. The muriatic acid gas, however, is now got rid of through its affinity for water—a discovery made within a month of the erection of the tallest of the tall chimnies—that of the St. Rollox Works in Glasgow. The gas is allowed to ascend a tower filled with coke, and through which water is continually passing. A combination takes place, and muriatic acid runs out at the bottom. For the manufacture of soda, salt is imported into the Tyne to the extent of about 80,000 tons a year. 100 lbs. of this salt, with 80 lbs. of sulphuric acid, makes sulphate of soda. The muriatic acid produced doubles the quantity of sulphuric acid used. It was formerly a waste product, but it is now applied in the manufacture of bleaching powder and bicarbonate of soda; also for making glue from bones. The sulphate of soda, now produced, is mixed with an equal quantity of dry ground chalk and half its weight of small coal. This mixture is well worked in a reverberating furnace, and drawn out in a liquid state. During this time the sulphur has left the lime, and the carbonic acid resulting from the combustion of the coals and chalk has gone to the soda. We have, therefore, in the ball soda, sulphuret of sodium, and carbonate of soda. When the ball cools, it is broken down, put into a vat, and warm water is poured upon it. In about six hours the liquor is run off, and fresh water run upon it, from time to time, till all soluble matter is abstracted. By this means the carbonate of soda is washed out, and the oxy-sulphuret of calcium, being insoluble, left behind. This residue is the tank waste, or tank heap, or soda-maker's waste. The liquor run off from the lixiviation of the balls is boiled down to dryness with sawdust, and the resulting salt is a mixture of carbonate of soda with caustic soda and sulphuret of calcium. This salt, usually called black or caustic salt, is burnt at a dull red heat. The sulphur is thus dispelled, and the soda carbonated by the combustion of the charcoal or sawdust. The carbonate of soda now drawn out usually contains between fifty and fifty-two per cent. of alkali. If pure enough, carbonate of soda may be sold in this state; but if, as commonly happens, it has gained some impurities, either from the sawdust, or through the formation of cyanide of iron in the tanks, it requires to be purified. This is done by dissolving the carbonate in boiling water, and allowing the impurities to sink to the bottom. The pure liquor is decanted off; part is run to the pans, in which it is boiled down to dryness afresh; it is then thoroughly dried in a furnace, and ground in a powerful mill; and this forms the common alkali or carbonate of soda of commerce, and may be obtained at any strength, from 30 to 58 per cent. of alkali. The same liquor, mentioned before, is also run warm into vats, and placed in a large, cool, well-ventilated house, where, in

about eight or twelve days, according to the weather, it crystallizes, forming the common soda or washing crystals. The liquor which does not crystallize—the "mother liquor"—is run back, to be made into weak alkali. To convert the soda into bicarbonate of soda, the crystals are placed in a large air-tight cistern, into which carbonic acid is introduced. The crystals lose water of crystallization, and absorb another equivalent of carbonic acid. It must be carefully dried at a low temperature, or it changes into sesquicarbonate of soda. In 1838, 50,000 tons of soda ash and 20,000 tons of crystallized carbonate of soda were made in England. In 1846 the manufacture was doubled; and at the present time our annual exports amount to 1,070,260 cwt., there having been an increase of 90,000 cwt. in the past as compared with the preceding year. Of the home consumption it is impossible to obtain any accurate account. On the Tyne there are fifteen manufactories, which each make, on an average, 100 tons of crystals per week, or 1,500 tons per week together, or 75,000 tons per year. These works will also produce, besides, about an average of 90 tons per week of alkali, or, in all, 66,500 tons per annum. Together, 141,500 tons:—a rough estimate of the produce of the Tyne. This important branch of our national manufactures enriches Sicily, whence we draw our sulphur; and Peru, the source of our supply of nitrate of soda. To meet the wants of Britain, Russia can extract the costly metal, platinum, from her mines at a remunerating price—the platinum vats of our manufactories costing from 1,000*l.* to 2,000*l.* each. The use of nitrate of soda, in place of saltpetre, has enabled us to return to our fields that potass which is so necessary to their fertility; and, moreover, has lowered the price of gunpowder, glass, and soap. In almost every department of industry, the production of soda from common salt has made itself benefically felt, and, in particular, encouraged and perfected the manufacture of soap and glass. Liebig takes the consumption of the former of these articles—soap—as a fair measure of a country's civilization and wealth; and if soap, so also soda. England, then, must be in the foreground of civilization; and the Tyne, most civilized of rivers; "for there is more soda made on its banks than on those of any other river in the world."—*Journal of the Society of Arts.*

## STERRY'S PATENT ROPE AND TWINE MOULDINGS.

Mr. George Sterry, of Worcester, has invented and patented a new method of manufacturing mouldings for cornices, picture-frames, and architectural decorations. Instead of employing wood or plaster, he uses as a basis or foundation, rope, cord, and twine, glued together into a shape nearly approximating to that of the finished moulding; and he completes the moulding and brings it to a sharp finished edge by applying a composition of whiting, size, and turpentine.

The entire process of manufacture is thus described by Mr. Sterry in the specification of his patent. He says:

"I take a number of pieces of rope, cord, twine, or the like, of different sizes, and having marked out on a board, or other flat surface, the form of frame or other article which I desire to produce, I proceed to glue the pieces of rope, cord, twine, &c., together in layers until a rough outline of the frame or other article is produced. I place the larger sizes of the rope, &c., at the back, and glue on the smaller sizes of cord or twine where the sharp edges of the moulding are to be formed. When the moulding has been brought by these means as near as possible to its intended form, I coat it with a mixture of boiling hot whiting, size, and turpentine, of about the consistence of cream, and allow it to dry. When dry it is again coated with a composition of red lead, white lead, oil, and turpentine, well mixed together, and it is then allowed to stand for a few days until quite dry. It is then again coated with the boiling hot mixture of whiting, size, and turpentine, used thin as milk. I then bring the blunt moulding to a perfect shape in the following manner. I take a piece of thin sheet brass, say about one-eighth inch thick, and having marked on it the section of the moulding to be finished, I cut or file away the brass to that form. I then take some strong whiting and size mixture, of about the consistence of treacle, and lay it warm over the rough moulding, and while still soft I draw the cut brass templane carefully over the moulding, and I continue to do so until the edges of the moulding are formed sharp and perfect. I then allow the moulding to dry, and when dry give it a final coating of red lead and oil, which makes it ready for the painter or gilder. By this process mouldings of almost any sectional form may be produced, possessing great strength and durability, and not liable to crack or open."

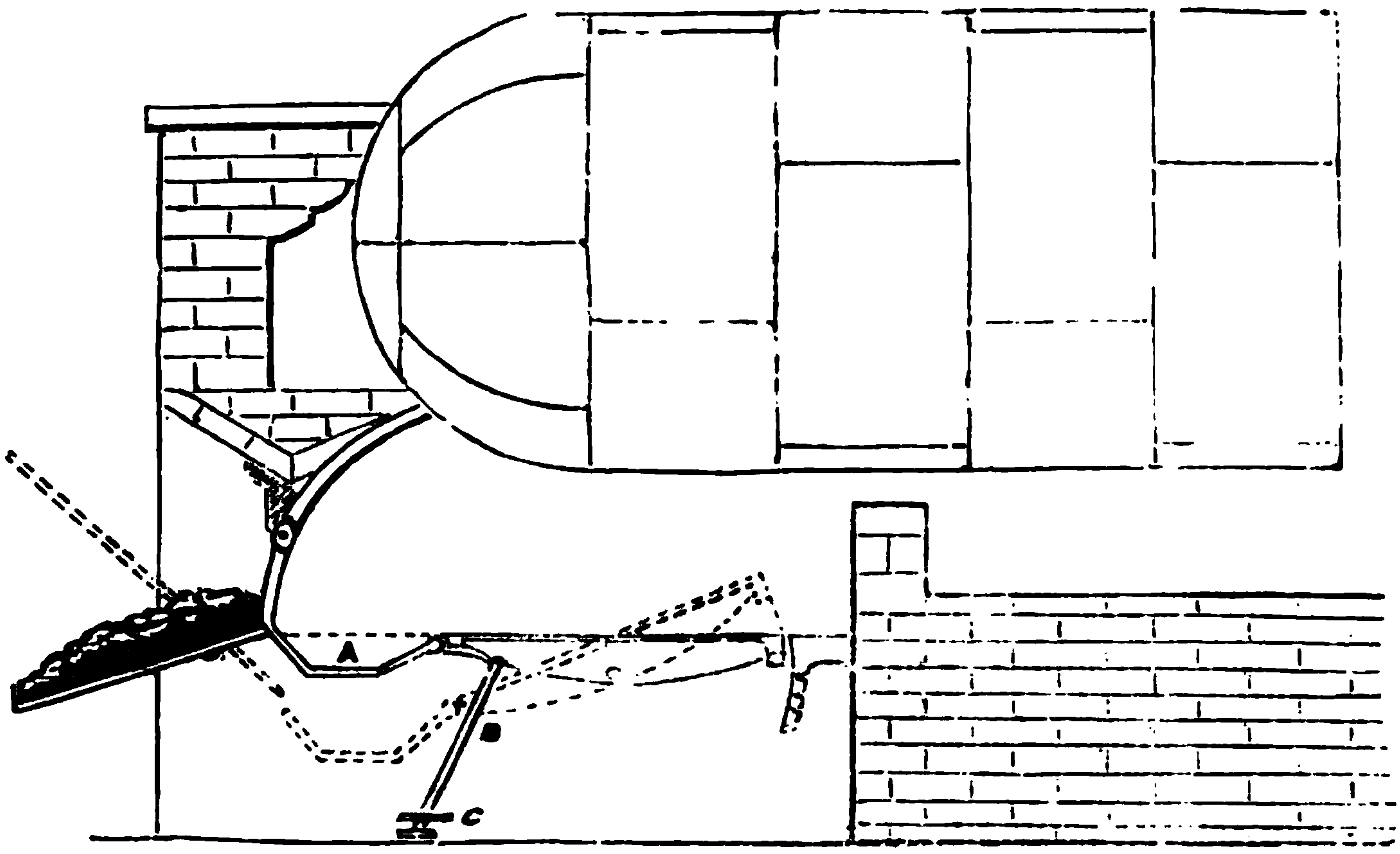
## THE PALMERSTON FURNACE.

*To the Editor of the Mechanics' Magazine.*

Sir,—The form of this furnace, here selected from the wide variety of applications of which its novel principle is susceptible, is especially calculated for burning, without

any evolution of smoke, the smallest screenings or "slack" of bituminous coal.

A is a dead plate, hinged to the front end of the semi-rotatory frame which supports the bars, the hinge being so disposed that the dead plate will fold upwards, but not downwards. When the grate and the hopper are brought into the position shown by the dotted lines, a full charge of coal falls into the receptacles of the dead plate. The swing-door which closes the front of the furnace yields sufficiently to admit the coal only, when the hopper rises, so that there is no prejudicial rush of cold air *en masse* into the interior of the furnace during the operation of feeding. The charge being delivered, the grate is restored to its proper level, and the hopper falls into the position for receiving a fresh supply of coal. A slow distillation of the coal in the dead plate commences, the gas passes over the fire, and is ignited by the contact of air streaming in sufficient quantity through small orifices at the back of the grate frame. When the small coal is sufficiently agglutinated to be charged on the fire, the grate is moved in the opposite direction to that shown by the dotted lines. As the front end rises, the lower end of the rod, B, catches in the collar, C, fixed in the wall of the ash-pit; and the upper end being attached to the short lever, fixed on the hinge




of the dead plate, this lever is depressed, and the dead plate carried up, its edge travelling along the curve of the front of the furnace, until the coal is discharged on to the fire, which is then an inclined plane, falling towards the back of the furnace. A copious supply of air, for the ignition of the larger volume of gas then evolved, is furnished through the perforations in the curved plate, which is seen fixed beneath the clinker plate. When the fuel is sufficiently incandescent, the grate is depressed to receive a fresh charge of coal on the dead plate, and then again restored to its proper position. For the sake of clearness, a considerable depression for feeding is represented in the engraving; but in practice a very slight depression is sufficient, barely enough to raise the lower part of the back end of the grate-framing to the level of the upper surface of the clinker-plate. When the grate is of considerable length, a thin plate is fixed to divide the trough of the dead plate, by which means the front half of the coal is retained until the dead plate passes the vertical position, and is therefore discharged further towards the back of the grate. This form of furnace is equally applicable to the pre-heating of anthracite, to avoid its decrepitation.

I am, Sir, yours, &c.,

DAVID MUSHET.

Sept. 12, 1854.

## ON WATER AS A CONDUCTOR APPLIED TO ELECTRIC TELEGRAPHS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I observe in your last Number a letter from Mr. Baddeley, suggesting a pipe of water in place of wire as a telegraphic conductor, and instancing Mr. Bain's ex-

periments as a proof of the small resistance of what is commonly termed the earth *circuit*.

Mr. Baddeley appears to misunderstand the phenomena involved, and inquires how it happens that so economical a conductor as water is not more extensively employed, even to the superseding of metallic wire.

It is now generally admitted by those who are well acquainted with the subject, that the hypothesis of a *circuit*, when the earth is used in place of a return wire in the telegraphic circuit, is untenable;* as the resistance offered to the passage of electricity through but an inch of water is immense, since it cannot pass without a considerable diminution or loss of the current accompanying the decomposition which must take place in the water.

The real explanation of the earth circuit is this: the earth serves as a general reservoir, and the flow of the electric sensation from a galvanic battery or magneto-electric apparatus through a wire connected with the earth at both ends, may be likened to the flow of water through a tube, the liquid being supplied at one end and passing out at the other, no *circuit* whatever taking place.

I am, Sir, yours, &c.,
CHARLES T. BRIGHT.

Liverpool, Sept. 18, 1854.

## LONG-RANGE RIFLE CANNON.

*To the Editor of the Mechanics' Magazine.*

SIR,—In the *Illustrated London News* of Saturday last, there is a description of Lancaster's "Oval Cannon," with diagrams; any one who will take the trouble to compare the two transverse sections of the bore of the gun with fig. 12, page 6, in my pamphlet on Projectiles, will see that Lancaster's "oval" is *alter et idem*, as the transverse section of my rifle-shot or shell, having two broad projections on them to fit into the two *broad* rifle grooves of my rifle. The form of Mr. Lancaster's rifled shot is *conoidal*, as he terms it; this form is not happy, because it *shifts* its position in the gun, even by ramming home, like the unfortunate spherical-leaden ball. The form of my rifle-shot and shell is cylindro-conoidal: the cylindrical portion being somewhat longer than the diameter of the bore of the rifle, prevents its shifting its position either in ramming down, or by the shock of the firing of the rifle-cannon. The form of Mr. Lancaster's shot is said to resemble the Minié ball; it may be so, as far as being conoidal, but in nothing else, for the Minié has no projections on it to fit into the grooves of the rifle, but has a sabot or iron cup fixed in its hollow base; it is this culôt that distinguishes it from my cylindro-conoidal *expanding* shot. Mr. Lancaster's shot has two *broad* projections on it to fit into the two *broad* grooves of his rifle-cannon, exactly similar to the rifle-shot and shell that I gave him about sixteen years ago, by the desire of Sir William Bowyer Smyth, Bart., M.P. for South Essex. The ingenious inventor of the American breech-loading rifle, Mr. Sharp, fully understands what the form of a rifle-shot should be; his rifle-shot is in form cylindro-conoidal.

I am, Sir, yours, &c.,
J. NORTON.

Victoria Hotel, Cork, Sept. 5, 1854.

* See Walker, Magrini, Highton, and others.

## PROFESSOR PAGE'S ELECTRO-MAGNETIC ENGINE.

A correspondent of the *Scientific American* supplies the following history of this invention, a full description of which was some time since published in our pages.

Prior to Professor Page's discoveries, all that was known of the axial attraction of a coil of copper wire was the philosophical toy known as De La Rive's Ring, and it was never for a moment supposed that a force of any practical utility could be derived from such a source; the writer has letters from Professors Faraday and Grove, of London, assuring him that up to the time of Professor Page's discoveries there never was a pound weight raised by this force. The first experiment of Page was with a very small engine, such as are constantly brought out to astonish the world, by the numerous tribe of inventors on this subject. A larger one was soon after made, which showed an increase of power in greater ratio than the increase of size—this looked like a discovery in the right direction, and he very soon raised a bar of fifty pounds weight, contrary to the expectation of all his scientific friends. This was an onward step, and an engine was then made that drove a double medium cylinder printing press having a power about equal to half a horse power. After this Congress made a small appropriation to carry out the invention, which was expended principally in preliminary investigation; but two engines were built and proved—the first was examined and proved by Professor Mapes for a company in New York, who thus describes what he saw, in his report, to those gentlemen. After describing the engine in general

terms, he says, "To the engine was connected by a shackle bar, a crank on a fly-wheel shaft; the crank 12 inches long, and the fly-wheel 4½ feet in diameter. Before starting the engine, I tied an arm of the fly-wheel at one-third greater distance from the centre than the length of the crank, to an upright beam of 12 inches square, which formed part of the frame of the engine. The cord used was the better kind of bed-cord, of great strength, and nearly three-eighths of an inch in diameter; this was passed twice around the fly-wheel arm and post, before being tied, and with pieces of sole leather intervening to prevent the cord from being cut by the corners of the post. Such a fixture, I am confident, would have held a five-horse power steam engine from starting, with full pressure of steam on the piston, and no previous motion. Not so, however, with this engine; for the breaking the string and the attachment of the battery occurred at the same instant of time, leaving an impression in the beam to the depth of the cord, despite the protection of the sole leather." Such are the facts noted by Professor Mapes; we will not quote his sanguine deductions therefrom; but he says he measured the power of this engine, while working, and found it to be 6·84 horse-power. As to the cost of this power, he thinks, from the imperfect data he had before him, it might be about twenty cents per diem for each horse power. This report needs no comment from the writer; it certainly shows anything but failure.

The next engine built by Professor Page was a locomotive for railroads, which the liberal and accomplished superintendent of the Baltimore and Ohio Railroad generously permitted to be tried on the Washington branch of that road. This machine was of the rudest and most primitive character. Professor Page had had no experience as an engineer, and but little in the construction of machinery, and it was a matter of wonder and surprise that this rude structure would move at all; it weighed, according to Professor Page, with its load, between eleven and twelve tons; its battery was so badly made that he lost the use of a greater portion of it; yet, notwithstanding all these difficulties, it was run out to Bladensburg and back, a distance of about twelve miles in all. The fastest rate of this engine on a level, was at the rate of nineteen miles per hour, which was carefully calculated by the revolutions of the driving-wheels. At this point in the progress of the invention, the money furnished by Government was all exhausted, as well as that of Professor Page's immediate friends, and he found himself in debt to a considerable amount; *consequently* the further progress of the undertaking then stopped; not because of failure, or of any doubt on the part of the Professor as to its practicability or final success.

## PRODUCTION OF WROUGHT-IRON DIRECT FROM THE ORE.

The following novel plans for the accomplishment of this object have recently been introduced in the United States. The first process is that of Mr. James Renton, who employs an arrangement of furnace so constructed that the surplus heat from the reducing chamber passes round a series of deoxidising tubes, from which the ore, in a partially calcined state, passes through a funnel-shaped receptacle into the puddling furnace. The flues are so arranged that one mass of fuel avails for the whole process, without exposure of the material to the action of atmospheric air, and the proprietors estimate a reduction of full 20 per cent. in the cost of production, as compared with the old processes. The series of deoxidising tubes are surrounded by the flues in every direction, flanked by walls of fire-brick 4½ inches thick, which are again surrounded by an inclosure of common red brick, 12 inches thick, and the heated products of combustion having given out a maximum producing effect, pass to the chimney shaft in the usual manner.—Another process, under Hilton's patent, is now being extensively adopted by Messrs. Davis and Co., of Cincinnati. In this case the ore is pulverized, and mixed with 20 per cent. of carbon, in the shape of common bituminous coal: the mixture is then put into air chambers heated by anthracite, from which it passes into the puddling furnace, heated by the same fuel; and nine blooms of 70 lbs. each have been turned out in 2½ hours. The iron is stated to be of the best description, and has been subjected to the most severe tests—such as making horse-shoe nails, screw bolts and nuts, and other articles, requiring the toughest metal.—A third plan is that of the Harvey Steel and Iron Company of New York, which consists of deoxidizing and desulphurizing the ores of iron, by causing the gases generated in the furnace to act directly in contact with them properly prepared, and placed upon suitably arranged tables, to the under side of which a high degree of heat is imparted, enabling them to produce malleable iron at one heat, without rendering the puddling operation a separate, as well as a secondary process, and thus obtaining the most economical results.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Cowper, Charles, of Southampton-buildings, Middlesex. *Improvements in the manufacture of potash and soda.* (A communication.) Patent dated February 24, 1854. (No. 447.)

This invention relates to the extraction of potash and soda from natural or artificial silicates containing those alkalies, such as felspar, &c.

Green, Benjamin Joseph, of Birmingham, Warwick, corrugated leather and other elastic manufacturer. *Improvements in the manufacture of corrugated elastic materials.* Patent dated February 24, 1854. (No. 449.)

This invention consists mainly in employing, in the manufacture of corrugated elastic fabrics, a thread, cord, or ribbon of gut, silk, flax, or other fibrous material, to be used along with the outer caoutchouc threads as a preventive to overstretching.

Bentall, Edward Hammond, of Heybridge, Essex, iron-founder. *Improvements in ploughs or implements for cultivating land.* Patent dated February 24, 1854. (No. 452.)

These improvements consist in adapting to the beam of a broad-share plough additional arms, so as to admit of extra tines or shares being applied to it, and in adapting to the back of the present arms of the broad-share plough additional tines or shares, so that the tines or shares may be arranged in pairs in advance of one another.

Forsyth, Thomas, of Wolverton, Buckingham, engineer. *Improvements in furnaces.* Patent dated February 24, 1854. (No. 454.)

This invention consists in combining the fire-bars of a furnace with apparatus in such manner as to cause the fire-bars to become part of a weighing machine, and so act as to regulate the supply of air to the fuel thereon, and so that the supply of air shall be caused to be shut off as the weight of fuel on the fire-bars decreases.

Bellford, Auguste Edouard Loradoux, of Castle-street. *Certain improvements in machinery for dressing stone.* (A communication.) Patent dated February 24, 1854. (No. 455.)

This invention consists mainly in the employment of a sliding hammer working in ways or guides, which also receive the cutting tool, or the stock of it, and are adjustable, so that the cutting tool may be set and the hammer caused to work in a line at any required angle to the surface which is to be produced.

Bellford, Auguste Edouard Loradoux, of Castle-street. *Improvements in turntables for railways.* (A communication.) Patent dated February 24, 1854. (No. 456.)

This invention consists in balancing the platform of the turntable upon the revolving roller carriage, which supports it in such manner that either end of the said platform may be depressed to rest upon a bed or bearing provided for it, while it receives or has discharged from it an engine or tender, and in furnishing the turntable between the roller carriage and platform on opposite sides of the centre with eccentrics, so that it may be supported on a level.

Bellford, Auguste Edouard Loradoux, of Castle-street. *Certain improvements in engines for generating power by means of the expansive force derived from heated air and gases, or by means of the expansive force of carbonic acid and other expansible liquids.* (A communication.) Patent dated February 24, 1854. (No. 457.)

This invention consists of a modification of Stirling's air engine.

Siemens, Charles William, of Adelphi Chambers, Middlesex, engineer. *Improvements in electric telegraphs.* (Partly a communication.) Patent dated February 25, 1854. (No. 459.)

The *first* part of this invention consists—1. In the arrangement of insulators to support metallic line-wire, by cementing a metallic stalk into a thimble or cup of insulating material with a projecting rim, presenting an enamelled or glazed surface, which cup is again cemented (by means of sulphur or otherwise) into the bottom of a cast-iron cup, affording protection and support. 2. In fastening the ends of adjoining pieces of telegraphic line-wire into a common insulated stalk of metal, by means of wedges introduced into notches from the opposite sides to the lengths of line-wire; and, 3. In discharging the static electricity or lightning from telegraphic line-wire through a vacuous space between two metallic surfaces, which are attached the one to the line-wire and the other to the earth. The *second* part of the invention consists—1. In connecting the similar poles of two batteries of nearly equal power, which batteries are placed at the two extremities of a railway train, for the purpose of sending signals from any intermediate point simultaneously in both directions. 2. In effecting the metallic communication for electric telegraphic purposes along a railway train, through the draw-chains and the side-chains usually connecting the carriages composing the train. 3. In a mode of insulating the side chain-bolts from the metal work of the carriage-frame; and, 4. In the construction of an alarum, having a hand or visible signal, and two bells of different sound, which are struck alternately, and a lever or indicator

to show when the spring requires winding up.

COLLIER, GEORGE, of Halifax, York, engineer. *Improvements in twisting fringes of shawl and other fabrics.* Patent dated February 25, 1854. (No. 461.)

This invention relates to machinery for twisting fringes obtained from warp and weft threads, left for that purpose in weaving the fabrics of which the fringes form a part. The improvements consist in the use of rotating elastic friction surfaces, between which and concentric plates, having cross lines or roughened surfaces, the threads to form the fringe are conducted in the required quantities, and twisted by being rubbed between the rotating surfaces and the concentric plates. These are then again twisted to form the fringes.

KEENAN, JAMES, of Paris, manufacturer. *Improvements in forming blocks or surfaces for printing.* (A communication.) Patent dated February 25, 1854. (No. 462.)

This invention consists—1. In producing printing surfaces by cutting out the figure or design from a plate or plates of prepared felt, wood, or other suitable substance, of the thickness of the required relief, and mounting the same by means of glue, cement, or other suitable means; and, 2. In a method of preparing felt with shellac, &c., by which the required properties for block and other kinds of printing are imparted thereto.

BEKAERT, CONSTANT FRANÇOIS, of Rue de la Victoire, Paris. *Improvements in linseed-oil for painting, called "oxigenated oil."* (A communication.) Patent dated February 25, 1854. (No. 463.)

This invention consists in the addition of chemical ingredients to boiled linseed-oil, for the purpose of preparing it for dull and bright painting.

LAMPORT, CHARLES, of Workington, ship-builder. *Improvements in machinery used in ship-building.* Patent dated February 25, 1854. (No. 464.)

The patentee claims the application of machinery (consisting of revolving cutters and other suitable tools) to trim, smooth, dub, plane, or otherwise work to their form, the timbers of wooden ships, inside and outside, and to bore the same for bolts, treenails, &c., when such timbers are erected in their places; also to trim, smooth, dub, plane, &c., planks when attached to the said timbers, to bore the same, and also to bevil and fair the edges; also to work all beads, chamfers, and mouldings required on the sides, at the gunwale, or on the bulwarks and rails; and also to plane and smooth the flat of the deck.

BOYDELL, JAMES, of Gloucester-crescent, Regent's-park, Middlesex. *Improvements in the manufacture of hurdles and fences.* Patent dated February 25, 1854. (No. 465.)

The patentee makes the uprights of hurdles and fences of trough iron, inlaid with wood, by which great strength is obtained with lightness; and in order to fix the uprights to the land, he makes the feet separate, the upper parts being by preference of trough iron, inlaid with wood, though solid iron may be used. The uprights are made with set offs, or right angle bends, at their lower ends, and they are fixed to the feet by nails, rivets, or screw-bolts. The rods or bars are fixed to the uprights by having holes in them corresponding with the distance of the uprights, through which nails, rivets, or screw-bolts are passed, to retain the parts of the hurdles or fences together.

ELDER, JOHN, of Glasgow, Lanark, engineer. *Improvements in marine steam-engines.* Patent dated February 25, 1854. (No. 466.)

This invention relates to horizontal direct action condensing marine engines for screw steamers, and consists in placing the steam-cylinder of the engine, or both steam cylinders of a pair of such engines, on one side of the screw-shaft, and the air-pumps and condenser on the other side; and in employing two or more air-pumps for each engine, and disposing them sufficiently far apart, in lines parallel to, and on each side of, their respective steam cylinders, to permit the connection-rods, guide-blocks, and cross-head frame to pass between them, and to be supported by them. The patentee employs four rods for each steam piston, and connects them in a suitable cross-head frame, beyond which the rods are prolonged, so as that the lower pair, one on each side, serve as the air-pump rods, and the upper pair serve the like purpose for the feed and bilge pumps.

STAITE, WILLIAM EDWARDS, of Manchester, Lancaster, gentleman. *Improvements in the treatment and preparation of madder and munjeet for dyeing and printing.* Patent dated February 25, 1854. (No. 468.)

The patentee claims—1. The use of an acetic acid bath in the treatment and preparation of madder and munjeet, combined with subsequent washing of the madder and munjeet in water and ammoniacal solutions preparatory to drying and grinding the same. And 2. The employment of an ammoniacal bath for the purpose of "ageing" new madder and munjeet.

WESTBROOK, FREDERICK, of Kensington, Middlesex. *Improvements in apparatus for facilitating the cleaning of windows.* Patent dated February 25, 1854. (No. 469.)

This invention relates to the portable stages usually employed by glaziers, painters, and others, to enable them to stand outside windows. The patentee constructs his stages as follows: he provides a wooden or metallic frame covered with board, and furnished with two projecting legs, and two wooden or metallic screws of sufficient length to reach from the board or frame outside the sill to the interior of the apartment. Upon these screws two clamps of wood or metal are placed, which may be either screwed to fit the screws, or loose upon them, and furnished with nuts. This arrangement allows the stage to be readily attached to any window-sill, whatever may be the thickness of the wall or the projection of the sill beyond it.

CHAPPUIS, EMILE, of St. Mary Axe, London. *Improved apparatus for the diffusion of light, called "Illuminators."* Patent dated February 27, 1854. (No. 470.)

These reflectors are composed of sheets or plates of glass of a prismatic form, joined together by wires or other suitable fastenings, and held in frames of gutta percha, wood, glass, or other material.

STIRLING, JOHN DAVIE MORRIES, of the Larches, near Birmingham, Warwick, esquire. *Improvements in the manufacture of tubes and cylinders of steel.* Patent dated February 27, 1854. (No. 472.)

This invention consists in casting steel into tubular or hollow cylindrical forms, and then extending them in diameter or length, or both, by hammering, by drawing or rolling, or by combining such processes.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, patent agent. *An improvement in the manufacture of tin foils or sheets.* (A communication.) Patent dated February 27, 1854. (No. 475.)

This invention consists in manufacturing tin foils or sheets from tin and lead combined, in such manner that the exposed surfaces of the foils or sheets shall be composed of tin, the interior parts thereof being of lead. For this purpose the tin and lead are cast in ingots in the required proportions, the tin being at the exposed surfaces; and these ingots are extended into foils or sheets by rolling in the usual manner.

The claim is for the manufacture of tin foils or sheets of the description mentioned, by the means and in the manner described.

MORRELL, JOHN, of Bradford, York, grocer. *Stopping the tap of any vessel containing oil, treacle, or any other liquid, as soon as the quantity required of such oil, treacle, or other liquid has been taken therefrom, such quantity being ascertained by weight.* Patent dated February 27, 1854. (No. 476.)

This invention consists in combining the tap or outlet of any vessel containing liquid with a weighing machine of the ordinary kind, having a fall of three inches at least, in such manner as to render the operation of shutting off the said tap or outlet self-acting, as soon as the desired quantity has been drawn off.

PALLEGOIX, LEONTIDE AGLAEE, spinster, and ALEXANDRE LOUIS BELLANGE, gentleman, both of Paris, France. *Improvements in treating wheat and other grain.* Patent dated February 28, 1854. (No. 477.)

This invention consists in a mode of treating wheat, corn, or other grain from which flour is produced by desiccating the same in drying chambers or stoves heated to about 95° Fahr., till they have lost from about four to eight per cent. of their weight, and then adding to them about an equal quantity of water or any other suitable liquid; during which operation the grains are continually turned, till the water or other liquid employed is as equally as possible distributed over the whole mass; after which the grains are ready for being manufactured into flour by any of the ordinary grinding processes.

DENNY, THEOBALD, of Strasbourg, France. *Improvements in engraving.* Patent dated February 28th, 1854. (No. 478.)

This invention consists in an improved mode of producing engravings on metallic plates suitable for ordinary surface printing.

THOMAS, FREDERICK SAMSON, of Cornhill, London, gentleman. *A new rifle-carriage.* Patent dated February 28th, 1854. (No. 479.)

This invention consists in the arrangement of rifle, musket, or pistol barrels, on carriages or supports, whereby a large number of discharges may be effected at once. The barrels are placed in close parallel tiers, and may be loaded at the breech by one operation.

MARSDEN, ELLIS, and JOHN MARSDEN, of Liverpool, Lancaster, engineers and brassfounders. *Improvements in pumps.* Patent dated February 28th, 1854. (No. 480.)

This invention relates to pumps used as fire engines, and for lifting and forcing generally.

The patentees use two single-action force-pumps, which are placed in an upright position, and between which they place an air-vessel, having an outlet on one side near the bottom thereof, for the ejection pipe. The tops of the pump cylinders have covers with suitable glands, through which the rods of the plungers work. The working beam is supported upon the top of the air-vessel, and the plunger-rods are attached to it by means of connecting-rods. The pump cylinders and air-vessel are mounted upon a

metal base or foundation plate, in which passages are formed to carry the water from the suction-pipe to the pumps and from the pumps to the air-vessel. Upon the top of the base or foundation plate are two openings for each pump, one of which extends from the suction-pipe, and is covered by a hinged valve, and the other (upon which there is no valve) communicates with a valve port of the air-vessel. The air-vessel is provided with a double valve, covering the ports through which the water is forced by the alternate action of the pumps.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in the means of admitting the steam or other motive power agent to and exhausting it from the cylinders of oscillating engines.* A communication. Patent dated February 28th, 1854. (No. 481.)

This invention consists in an arrangement of steam chest pipes and stuffing boxes for admitting steam or other fluid to and exhausting it from the cylinder effectively, without allowing it to pass through the trunnions. The peculiarity of this arrangement is that the steam, or other fluid, is admitted to the cylinder by means of pipes arranged in a circle from the axis of the cylinder's oscillation, and entering opposite sides or ends, of a steam chest attached to the cylinder, the admission of the steam being controlled by a valve in the said steam chest or by the movements of a slide valve.

REHÉ, JOHN HENRY, of Bayswater, near London. *Improvements in machinery or apparatus for mixing, washing, crushing, bruising, reducing, or comminuting various substances.* Patent dated February 28, 1854. (No. 482.)

The machinery or apparatus which forms the subject of this patent, consists of a cylinder made of, or lined with metal, the interior of which is formed into a series of angular projections, and within which work a series of beaters, secured to arms fixed to a central rotating shaft. The substances to be reduced are placed within the cylinders, and are crushed by the blows of the beaters against the projections.

SIMPSON, WILLIAM, of Tovil Upper Mills, near Maidstone, Kent. *An improvement in employing in the manufacture of soap a product obtained when manufacturing pulp from straw.* Patent dated February 28, 1854. (No. 483.)

This invention consists in the employment of alkaline solutions which have been used for acting on straw preparatory to making pulp, for again acting on fats and oil for the production of soaps.

MALLET, ANDRÉ LOUIS, of Rue de la Pepinière, Paris. *Improvements in apparatus to destroy the effects of shocks.* Patent dated February 28, 1854. (No. 485.)

This apparatus consists of a plunger or or solid piston, which passes through a cupped leather into a chamber containing sufficient liquid to cover completely the end of the plunger which works horizontally, and is thus kept tight. The space in the chamber above the level of the liquid contains air or gas, which is compressed by forcing in the plunger, which it again forces out when the pressure is removed.

PATTEN, WILLIAM, of Old Fish-street, London. *Improvements in valves and apparatus for supplying water.* Patent dated February 28, 1854. (No. 486.)

This invention is carried out as follows: —A valve-box is arranged with two valves, an inlet and an outlet valve. The stem of the former is connected with a weighted lever, and is moved by a handle, or by the seat of a water-closet, or otherwise; the valve opening against the flow of water into the valve-box. The water entering the valve-box, flows to a small cistern or receiver, from which, when the inlet valve is closed, it is allowed to flow into the water-closet or other basin, the outlet-valve being opened for this purpose by a projection on the stem of the inlet valve coming against one end of the lever on which it is mounted. The outlet valve will again be closed when the inlet valve is opened.

WAY, JOHN THOMAS, of Holles-street, Middlesex, and JOHN MANWARING PAINE, of Farnham, Surrey. *An improvement in the manufacture of gas, and also of a charred product.* Patent dated February 28, 1854. (No. 489.)

This invention consists in distilling a compound matter, consisting of a stone or earth largely composed of soluble silica (found in Surrey and probably in other places) and tar, fat, oil, or other organic matter, and thereby obtaining gas for the purposes of light and heat, and a charred product suitable for making filters, and for decolorizing and deodorizing purposes.

JOHNSON, THOMAS JAMES, of Booth-street, Spitalfields. *Improvements in apparatus for roasting malt.* Patent dated February 28, 1854. (No. 490.)

This apparatus consists of a chamber, into which heated air is forced from a heating apparatus, and the upper part of which is enclosed by a semi-cylindrical cover, an opening being left to let out the heated air, &c. Within the chamber there is a revolving cylinder, the periphery of which is composed of woven wire cloth, and through which are inserted several tubes of wire cloth. The heated air passes from the chamber into the cylinder through its periphery and through the tubes by which it is

traversed, and is thus enabled to act on all parts of the mass of malt which is contained in the cylinder.

HOLBECHE, JOHN SODEN, of Sutton Coldfield, Warwick, builder. *Improvements in the construction of invalid bedsteads, which said improvements are also applicable for couches, chairs, and reclining seats or beds for invalid carriages.* Patent dated February 28, 1854. (No. 491.)

This invention consists—1. In applying to bedsteads, couches, chairs and carriages for invalids, cords of caoutchouc, or other springs which yield and contract longitudinally, and are so adapted to the weight of the body as to form a counterpoise thereto, the frame of the bed or couch being jointed so as to conform itself to the positions the patient may wish to assume. 2. In so constructing the bottom, or foot part of bedsteads, that the footboard may be converted into a table or reading desk. 3. In so arranging the bottom part of the bedframe, that it may be inclined, at any angle that may be required, for the support of the legs. 4. In removing a portion of the foot posts, or so constructing them, that they may be shortened and re-lengthened at pleasure.

HARGROVE, CHARLES, of Birmingham, Warwick, manufacturer. *An improvement or improvements in steam boiler and other furnaces.* Patent dated March 1, 1854. (No. 496.)

This invention consists in making the fire-bars of steam boiler and other furnaces hollow, and introducing air heated by passing through the said hollow bars at the bridge or other suitable part of the furnace, for the purpose of suppressing or preventing the formation of smoke.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BANFIELD, JOHN, of Birmingham, Warwick, organ builder. *Improvements in apparatus for communicating (while riding) with the drivers or guards of public or private vehicles.* Application dated February 24, 1854. (No. 448.)

The inventor proposes to convey sounds, produced by the aid of a whistle and a speaking trumpet, through gutta percha tubes.

MACNAB, WILLIAM, of Greenock, Renfrew, engineer. *Improvements in steam engines of the class usually termed trunk engines.* Application dated February 24, 1854. (No. 450.)

The piston of Mr. Macnab's engine has no central passage through it, the connecting-joint rod is on the side next the crank shaft, and a solid piston-rod is attached to and projects from the opposite side of the piston, being screwed or otherwise attached to its centre.

FISHER, CYRIL JEDDERE, of the Temple, London, Esq. *Improved means of detecting forged or counterfeit bank-notes, bills of exchange, cheques, or other documents, labels, or trade marks.* Application dated February 24, 1854. (No. 451.)

This invention consists simply in printing on the notes, bills, &c., impressions taken on metal plates from feathers, insects, the leaves of plants, or other natural objects, or artificial or manufactured articles.

POWER, EDWARD, of Birmingham, Warwick, gentleman, and THOMAS KNOWLES, of the same place, watchmaker. *Improvements in watches, spring-clocks, and timepieces.* Application dated February 24, 1854. (No. 453.)

This invention consists in substituting a loose arbor for the fusee, instead of a fixed one, which arbor has a small ratchet catch and spring placed between the top of the fusee and the fusee cap, the latter being screwed on, and not soldered.

BARKER, JOHN, and JOHN ANDREW, both of Salford, Lancaster, salesmen, and WILLIAM HAYES, of Salford aforesaid, bleacher. *Improvements in cleansing sheep's wool, mohair, and other animal fibrous substances.* Application dated February 25, 1854. (No. 458.)

This invention consists in steeping the fibrous substances to be cleansed in oil or other fatty matters (either in a cold or heated state,) till the pitch or other impurities are held in solution, when the fibrous substances are further cleansed by scouring.

PLANTIN, ALEXANDRE, of Thayer-street, Manchester-square, Middlesex. *Improvements in the arrangement and combination of apparatus for stopping and retarding railway trains and carriages.* Application dated February 25, 1854. (No. 467.)

This invention consists of an arrangement for applying the breaks of all the wheels simultaneously by means of the rotation of the wheels themselves.

FOUGERAT, PIERRE (PETER), of Bordeaux, France, civil engineer. *Improvements in paddle-wheels of steam-vessels.* Application dated February 27, 1854. (No. 471.)

The patentee explains the mathematical principle on which his invention is founded, but gives no description of the manner of putting it into practice.

BUSSY, CHARLES DE, of Mornington-road, Regent's-park, Middlesex, mining engineer. *Improvements in machinery or apparatus for the amalgamation of gold ores.* Application dated February 27, 1854. (No. 473.)

This invention consists of an arrangement of apparatus in which the ore is brought in

contact with a film of mercury taken up on the surface of a revolving vessel of a parabolic section. The gold contained in the ore sinks into the mercury, while the refuse matter slides down the sides of the vessel to the discharge orifice.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in harrows.* (A communication.) Application dated February 27, 1854. (No. 474.)

This invention consists in constructing a drag harrow of three parts, arranged together with three joints in such a manner as to constitute a right angled triangle, each part having the power of accommodating itself to the nature of the surface over which it moves.

MATHER, COLIN, of Salford Iron-works, Manchester. *An improvement in valves for reducing the pressure of steam.* Application dated February 28, 1854. (No. 484.)

This invention consists of a combination of apparatus for reducing high pressure steam to lower pressure steam, by causing the steam on the low pressure side of the valve to press on a body of mercury contained in a receptacle in one end of a lever (which opens and closes the valve), and forcing it to the other end of the lever, and thereby closing the valve and consequently reducing the pressure to the degree required.

MEDWIN, JAMES, of the Blackfriars-road, Surrey, engineer. *An improvement in water-gauges for steam boilers.* Application dated February 28, 1854. (No. 487.)

This invention consists of an arrangement for indicating when the water in a steam boiler is too high or too low. For this purpose the float has a rod connected to a slide-valve in a slide-box, the passage from which communicates with a steam whistle; hence, when the float rises or falls, it opens the passage, and the whistle is sounded, and by a pointer it is shown whether the water is too high or too low in the boiler.

SHEPARD, EDWARD CLARENCE, of Trafalgar-square, Middlesex. *Improvements in decomposing water by electric currents.* (A communication.) Application dated February 28, 1854. (No. 488.)

This invention consists in coupling the forces which result from the electric or electro magnetic currents with the forces which result from the affinity, or from the attraction of certain bodies for oxygen, for the purpose of favouring the parting of the elements of water.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *An improved apparatus for facilitating the acquirement of the art of reading.* (A communication.) Application dated February 28, 1854. (No. 492.)

This apparatus consists of a flat box or case, containing a series of endless paper bands mounted on rollers, and on which are printed a number of letters, syllables, sounds, and words, which are successively brought behind suitable openings in the box-front, by turning small buttons on the outer ends of the rollers round which the bands are passed.

GILBERT, HENRY, of Suffolk-street, Pall-mall East, Middlesex, dentist and surgeon. *Improvements in connecting and supporting artificial teeth.* Application dated March 1, 1854. (No. 493.)

The improvements consist in covering steel and other springs employed for connecting and supporting the upper and lower sets of teeth, with a coating of gutta percha or India-rubber, or both combined, or with a coating of gold deposited by the electrotype process; and also in forming such springs of gutta percha or India-rubber, either solid or tubular.

CORTIN, JEAN TOUSSAINT, of New Compton-street, Soho-square, Middlesex. *Soleing shoes and boots with leather combined with gutta percha and wood, sewed with metallic wire.* Application dated March 1, 1854. (No. 494.)

The nature of this invention is explained by the title.

EHRHARDT, WILHELM, of Birmingham, Warwick, machinist. *Improvements in the construction of ordnance and fire-arms, and in loading the same.* Application dated March 1, 1854. (No. 495.)

This invention relates to breech-loading ordnance and fire-arms, and consists mainly in an arrangement by which the end of the cartridge is sheared off in the act of introducing it into the barrel of the piece.

CURTIS, WILLIAM JOSEPH, of Birchin-lane, London, civil engineer. *An improved levigating machine.* Application dated March 1, 1854 (No. 497.)

This machine consists of a hollow case, of a cylindrical or other suitable form, in which is placed a runner of a corresponding form. Both the case and the runner are caused to rotate either at the same or at a different rate of motion.

## PROVISIONAL PROTECTIONS.

*Dated July* 8, 1854.

1504. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of carbonates of soda. A communication.

*Dated July* 21, 1854.

1608. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in

treating raw silk fabrics while being dressed and dyed. A communication from Messrs. C. Jandin and A. Duval, of Lyons, France.

*Dated July* 31, 1854.

1683. Jean Chrilottome Denis Demay, of Leicester-square, London, acting for Antoine Charles Cardot, a mechanician engineer, in Paris, France. Preventing the accidents on the railways with the aid of a right line of iron, and in stopping the trains almost instantaneously. A communication from the said Antoine Charles Cardot.

*Dated August* 11, 1854.

1758. Walter Blundell, of New Broad-street, London, surgeon dentist. An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon for the purpose of totally or partially benumbing the sense of feeling at the desired part of the human body.

*Dated August* 23, 1854.

1854. Aristide Balthazard Bérard, of Paris, France, engineer, and chevalier of the Legion of Honour. Certain improvements in the manufacture of gas coke and other products from coal, and in apparatus for that purpose.

1856. Julien Louis Pierre Jean Baptiste Hector Bouvet, of Paris, France. An improved suction apparatus for pumping and exhausting purposes.

*Dated August* 24, 1854.

1858. William Brooke, of Martin's-lane, Cannon-street, London, manufacturing chemist. Consuming smoke, and condensing noxious and other gases and vapours, and converting the products thereof to valuable purposes, which now escape to the injury of animal and vegetable life.

1860. Thomas Hayter, of the King's Head, Southwark. Improvements in apparatus for holding straps for sharpening razors.

1862. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in apparatus for illuminating. A communication.

*Dated August* 25, 1854.

1864. Robert Beck Froggart, of Manchester, Lancaster, analytical and manufacturing chemist. Improvements in the mode or method of purifying, clarifying, and reducing the specific gravity of oils or fatty bodies, and also of clarifying fermented liquids with the machinery or apparatus used in the said processes.

1866. James Thomas Skinner, of Georgiana-street, Camden Town, Middlesex, engineer. Improved apparatus for rendering the shunts or points of railways self-acting, applicable also to the working of railway signals.

1868. Henry Bessemer, of Baxter-house, Old Saint Pancras-road, Middlesex, engineer. Improvements in guns for throwing projectiles for naval and military purposes.

*Dated August* 26, 1854.

1870. George Wall, of Manchester, Lancaster. Improvements in machinery or apparatus for the manufacture of pottery.

1872. John Gedge, of Wellington-street South, Middlesex. Improvements in boring instruments, known as augers, bits, or gimlets. A communication from Mr. Ransom Cook, of the United States of America.

1874. Corentin Marie Perron de Kermoal, gentleman, of Paris, France. An improved system for preserving and transporting animal and other alimentary substances.

1876. Henry Francis, of the Strand, Westminster, engineer. A machine for scutching flax, hemp, and other like fibrous materials.

*Dated August* 28, 1854.

1878. Auguste Antoine Legras, mechanician, of Paris, France. An improved apparatus for regulating the level or flow of liquids.

1879. Thomas Carr, of Liverpool, Lancaster, share-broker. Improvements in steering apparatus.

1880. Robert M'Connell, of Glasgow, Lanark, iron founder. Improvements in shutters for doors and windows.

1881. James Donovan, of Church-path, Hackney, Middlesex, gentleman. An improved mode of constructing steam boiler and other furnaces for the purpose of consuming smoke.

1882. John Kirkham, of Tonbridge-place, New-road, and Thomas Nesham Kirkham, of Edith-grove, West Brompton, Middlesex, engineers. Improvements in the process of manufacturing and purifying gases for lighting and heating, and in apparatus to be employed therein.

1883. George Burch, of Waltham-cross, Cheshunt, Herts. Improvements in the manufacture of pulp.

1884. John Gray, of Strand-street, Liverpool. Improvements in the mariners' compass.

*Dated August* 29, 1854.

1885. Isaiah James Machin, of St. Giles-in-the-Fields, Middlesex, machinist. Improvements in cutting screws.

1886. James Lamb Hancock, of Milford-haven, Pembrokeshire. Improvements in machinery for draining land.

1887. Joseph Burridge, of Great Portland-street. Improvements in apparatus for closing fireplaces.

1888. John Gray, of Dublin, M.D. A self-acting flushing-apparatus, which may be arranged for registering the quantity of water or other liquid flowing through it.

1889. Thomas McNally, of William-street, Blackfriars, London, carpenter and builder. Improvements applicable to window-sashes or shutters.

1890. Louis Napoleon Langlois, gentleman, and Jean Baptiste Clavières, mechanical engineer, both of Paris, France. A new mode of constructing steam boilers.

1891. Jean de Redon, of Paris, France, civil engineer. A new machine for cutting or preparing wood to be used in the manufacture of paper.

1892. John Seithen, of Wakefield-street, Brunswick-square. Improvements in the manufacture of cases or envelopes for covering bottles.

1893. John Fisher Williams, of Artillery-place West, Bunhill-row. Improvements in joining cast-iron tubes.

*Dated August* 30, 1854.

1895. Jules Mathieu, of Paris, France, civil engineer. Improvements in pumps. A communication.

1896. William Campion, of Nottingham. Improvements in the manufacture of warp fabrics.

1898. William Nimmo, of Pendleton, Lancaster, spinner and manufacturer. Improvements in machinery or apparatus for producing ornamental woven fabrics.

1900. John Seithen, of Wakefield-street, Brunswick square. Improvements in apparatus for cutting squares of cork.

1901. William Symington, of King William-street, London. Improvements in apparatus for heating air by means of steam.

*Dated August* 31, 1854.

1902. Michel Napoleon Illakowicz, artist, of Maddox-street, London. Improvements in picture frames.

1903. Robert Christopher Witty, of Torriano-avenue, Camden-road-villas, Middlesex, civil engineer. Improvements in illumination by means of artificial light.

1905. Julian Bernard, of Club-chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of combs.

1906. Eugéne König, of Rue du Temple, Paris, France, upholsterer. Improvements in manumotive carriages.

1907. William Campion, of Nottingham. Improvements in rotary knitting-machinery.

1908. John Macmillan Dunlop, of Manchester, Lancaster, engineer. Improvements in machinery or apparatus for preparing, cleaning, and cutting India-rubber and gutta percha. Partly a communication.

*Dated September* 1, 1854.

1910. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved soap, to which he gives the name of saponitoline. A communication.

1911. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in apparatus for retarding and stopping railway carriages. A communication.

1912. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved process of manufacturing alcohol from the stem and ear of maize. A communication.

1913. Marie Louise Lindheim, independent lady, of Paris, France. Certain improvements in the manufacture of bonnets or caps.

1914. James Danks, of Birmingham, Warwick, glass-cutter. An improvement or improvements in inkstands, which improvement or improvements may also be applied to the stoppers of bottles, the packing of pistons, and other like purposes.

*Dated September* 2, 1854.

1915. Joseph Worthington, of Manchester. Improvements in counters or fittings of shops, warehouses, and offices, for arranging, preserving, and exhibiting articles therein.

1916. Hezekiah Edwards, of Islington, commission-agent, and James Hodson, of the same place, Middlesex, warehouseman. Improvements in the formation of envelopes.

1917. George Lewis, of High Cross-street, St. Martin's, Leicester, lock-maker. Improvements in the construction of locks.

1918. William Finlay, of Aylesford, Kent, superintendent of the Aylesford Pottery Company's Works. Improvements in machinery for manufacturing bricks and tiles.

1919. Henry Bernoulli Barlow, of Manchester, patent-agent. Improvements in machinery for cleaning cotton and other fibrous materials. A communication.

1920. Nicholas Callan, of Maynooth-college, Kildare, Ireland, professor. Improvements in certain galvanic batteries.

1921. Pierre André Decoster, civil engineer, of Paris, France. Certain improvements in extracting the saccharine parts of the sugar-reeds, and of other sacchariferous substances.

1922. Thomas Craddock, of Portway Foundry, Potter's-lane, Wednesbury, Staffordshire, engineer. Certain improvements in the steam engine.

1923. Richard Dugdale Kay, of Accrington. Improvements in machine printing.

1924. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in machinery applicable to the cutting, dressing, and polishing of stone. A communication.

*Dated September* 4, 1854.

1925. Edward Alfred Cowper, of Great George-street, Westminster, Middlesex, civil engineer. Improvements in self-feeding furnaces, and in machinery for working such furnaces.

1929. John Lockhart White and Henry Henderson, plumbers, and James Couper, senior, earthenware manufacturer, all of Glasgow, Lanark. Improvements in water-closets.

1931. Ellis Rowland and James Rowland, of Manchester, Lancaster, engineers. Improvements in coupling or connecting links for railway carriages or other such purposes.

1933. Samuel Mayer, of Bristol, and William Bush, also of Bristol, millwright. Improvements in reducing flint and other substances, rendering them suitable for the manufacture of porcelain and other earthenware articles.

1935. John William Sloughgrove and James Henry Wheatley, of Windsor-street, Islington, engineers. Improvements in furnaces and ovens to promote the consumption of smoke.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September* 19*th*, 1854.)

1027. Henry Moore Naylor. A new or improved instrument for cutting various articles of food.

1039. William Coles Fuller. Certain improvements in the adaptation of Indian-rubber springs.

1045. John Lawson, Improvements in drawing ships out of water. A communication.

1046. Joseph Shepherd. Improvements in compound steam engines.

1057. William Waite. An improvement applicable to the construction of sewers, drains, and pipes for the conveyance of sewage water or gas.

1058. Christopher Nugent Nixon. Improved modes of attaching rudders to floating vessels.

1070. Frederick Smith. An improved arrangement of furnace for consuming smoke.

1073. Jérome André Drieu. Certain improvements in machinery or apparatus for cutting fustians, velveteens, and other similar fabrics to produce a piled surface.

1075. Richard Clarke Burleigh. Certain improvements in steam engines and other engines worked by the pressure of gaseous or other fluids, which are also applicable to pumps.

1078. Henry Young Darracott Scott. An improved cement applicable as a plaster, or for moulding purposes.

1080. Louis François Saugrin. Improvements in apparatus for the production of stereoscopic and photographic pictures.

1110. John Henry Johnson. Improvements in printing telegraphs. A communication from Meinrad Theiler.

1114. Joseph Hinchliffe, junior, Certain improvements in apparatus for regulating or governing the speed of steam engines.

1141. Charles Bostock. Certain improvements in machinery or apparatus for cleaning and doubling silk.

1147. Louis Emile Dufour. Improvements in breech-loading fire-arms.

1152. John Lawson. Improvements in the manufacture of cut piled fabrics.

1240. Antoine Chavanes. Improvements in apparatus for indicating the time a public carriage is and is not engaged for hire. A communication.

1250. Lemuel Brockelbank. Improvements in manufacturing lubricating matters.

1269. Bewicke Blackburn. Improvements in the manufacture of pipes when applying slate for such purpose.

1349. Robert Reeves. Improvements in drills for drilling liquid manure.

1365. John Fry Heather, M.A. Improvements in apparatus for regulating the flow of gas.

1373. Ephraim Smith. An improved watch-key.

1383. Auguste Edouard Loradoux Bellford. An improvement in propelling vessels in water. A communication.

1418. William Coltman. An improvement in knitting-frames.

1475. Thomas Restell. An apparatus or holder for holding parcels of gloves and other goods and papers.

1484. John Lamb. Improvements applicable to machines for cutting paper.

1504. John Henry Johnson. Improvements in the manufacture of carbonates of soda. A communication.

1611. Charles Harratt. Improvements in fastenings for ship-building.

1683. Jean Chrilottome Denis Demay. Preventing the accidents on the railways with the aid of a right line of iron, and in stopping the trains almost instantaneously. A communication from Antoine Charles Cardot.

1687. Alfred Vincent Newton. An improved mode of extracting sulphur from compounds of india rubber and sulphur. A communication.

1695. Richard Archibald Brooman. Improvements in machinery for dressing flax, hemp, and other like fibrous substances. A communication.

1707. William Gossage. Improvements in the manufacture of certain kinds of soap and other detergent compounds.

1758. Walter Blundell. An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon for the purpose of totally or partially benumbing the sense of feeling at the desired part of the human body.

1760. John Gibson. Improvements in the manufacture of railway wheels.

1763. Pierre Athanase Roguier. New mode of treating and curing varicose veins of the human body. A communication.

1777. John Norton. Improvements in bolts and projectiles for fire-arms.

1805. Joseph Powell Walton. Improvements in obtaining impressions from lithographic stones or plates.

1809. William Edward Newton. Improved machinery for cutting files and rasps. A communication.

1811. John Coney. An improved construction of corkscrew.

1821. William Fox and William Henry Fox. Improvements in furnaces to facilitate the combustion of smoke.

1826. James Hodgson. Improvements in the construction of iron vessels.

1847. William Edward Newton. Certain improvements in carding engines. A communication.

1850. Theodore Schwann. Improvements in machinery or apparatus worked or actuated by helicals or spirals.

1851. John Norton. An igniter or apparatus for igniting explosive and combustible materials.

1862. Peter Armand Le Comte de Fontainemoreau. Certain improvements in apparatus for illuminating. A communication.

1865. Joseph Henry Tuck. Improvements in packing for pistons, piston rods, valves, and other uses.

1872. John Gedge. Improvements in boring instruments, known as augers, bits, or gimlets. A communication from Mr. Ransom Cook, of the United States of America.

1884. John Gray. Improvements in the mariner's compass.

1887. Joseph Burridge. Improvements in apparatus for closing fire-places.

1915. Joseph Worthington. Improvements in counters or fittings of shops, warehouses, and offices, for arranging, preserving, and exhibiting articles therein.

1923. Richard Dugdale Kay. Improvements in machine printing.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council by George Lowe, of Finsbury Circus, in the city of London, engineer to the Chartered Gas Company, praying Her Majesty to grant a prolongation of the letters patent granted to him 16th March, 1841, for "Improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating powers."

On the 4th December an application will be made to the Committee to fix an early day for the hearing the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council Office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed September* 15, 1854.

614. Richard Archibald Brooman.
630. Donald Bethune.
636. William Holt.
646. John Hick.
648. William Dantec.
655. Edward Esnouf, Charles Mauger, jun., and George Washington Lewis.
667. James Hansor.
692. Richard Doidge and John Cloves.
698. James Lochhead and Robert Passenger.
767. John Swarbrick.
782. James Howden.
783. Constant Bekaert.
791. Charles de Bergue.
811. Jonathan Jopling.
812. William Henry Bentley.
813. Thomas Wood.
842. Richard Archibald Brooman.
868. Giuseppe Devincenzi.
927. Thomas Freman Finch.
942. William Blackwood.
996. Moses Poole.
1040. Peter Ambjorn Sparre.
1208. Charles Claude Etienne Minié.
1299. Thomas Wilson and John Hadley.
1482. Otis Avery.
1549. John M'Gaffin.
1563. Matthew French Wagstaffe and John William Perkins.

*Sealed September* 19, 1854.

741. Alfred Augustus de Reginald Hely.
1495. George Beard and William Beard.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*E. Hart.*—The arrangement proposed by you has already been adopted in some forms of engine.
*H. F. S. H.*—Your communication shall appear in an early number.



## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1625.] SATURDAY, SEPTEMBER 30, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## SELBY'S PATENT STEAM BOILERS.

Fig. 2.

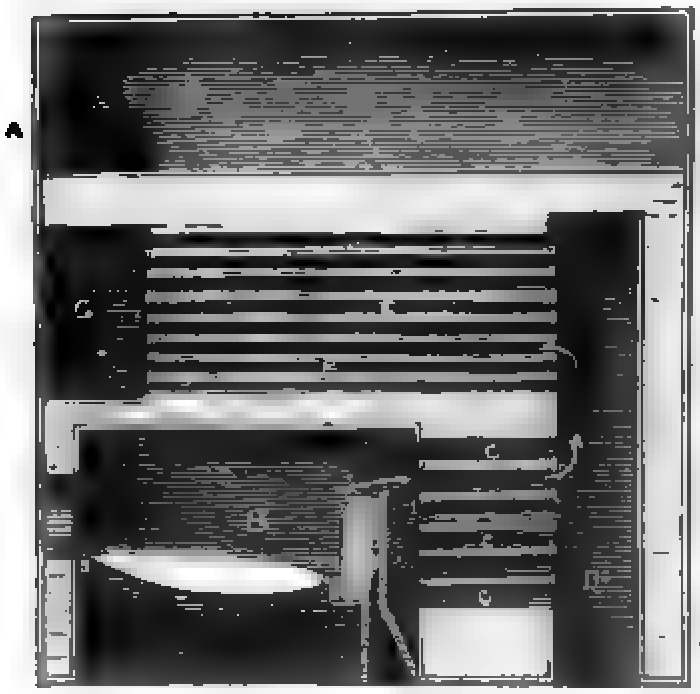


Fig. 1.

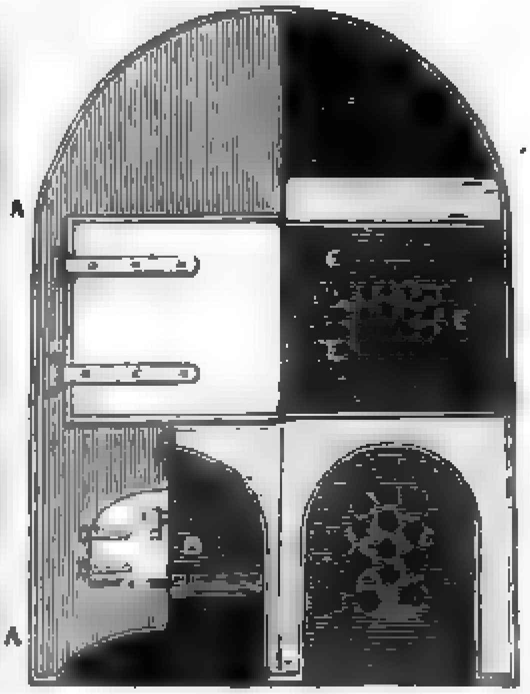
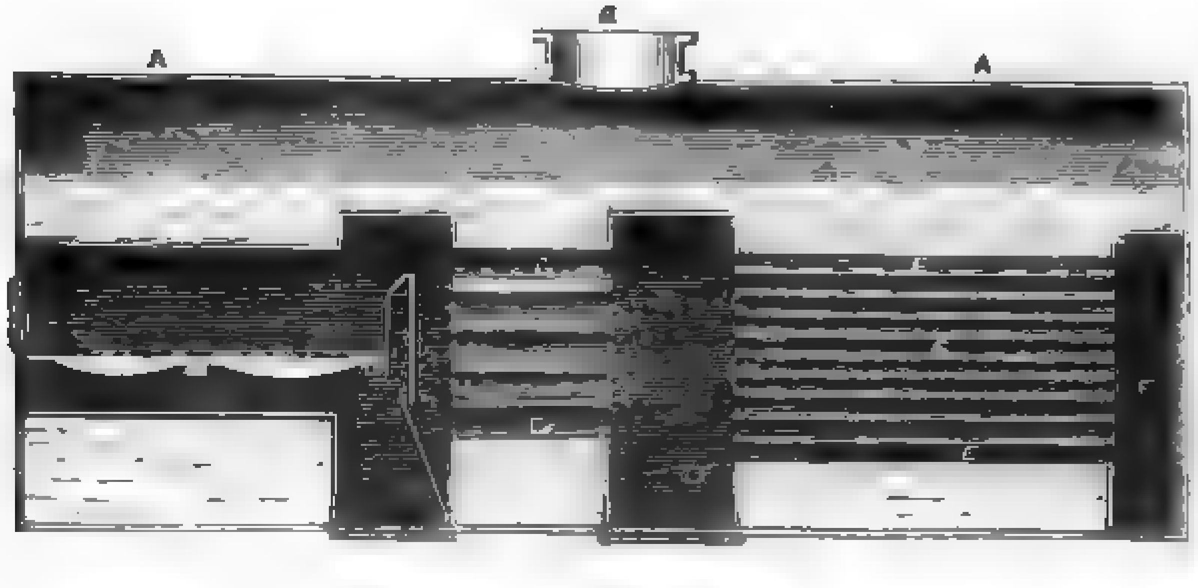


Fig.



## SELBY'S PATENT STEAM BOILERS.

(Patent dated October 30, 1852.)

The peculiar feature of novelty in these boilers, which are constructed under the patent of Mr. George Thomas Selby, of the Smethwick Tube Works, near Birmingham, consists in the introduction of a chamber or chambers between two or more sets of tubes or flues, for the better combustion of the fuel, in such a position or positions that the gases and smoke, after having passed through one set of tubes or flues, and been divided, are again brought into contact in the chamber, and become remixed as they pass on to another set or sets of tubes or flues.

Fig. 1 of the accompanying engravings represents a front elevation of a marine boiler, and fig. 2 a longitudinal section of the same.

A A is the shell of the boiler; B, the furnace; C C, the first set of tubes or flues, which communicate from the furnace, B, into the combustion chamber, D D, in which the gases and smoke are remixed before entering into the second set of flues, E E, which return along the length of the boiler and open into the flue, G, which is in communication with the funnel or chimney. The second set of tubes may be made of a smaller diameter, and also of a greater length than the first set, for the completion of the draught and combustion.

Fig. 3 is a longitudinal section of a stationary boiler.

A is the shell of the boiler, which has two sets of furnaces, both of them being in communication with the first set of tubes; C D is the combustion chamber; E the second set of tubes; and F the smoke-box, which is in connection with the stack or chimney. The combustion chamber for the remixture of the smoke and gases may be applied to locomotive and all other classes of boilers for the generation of steam in which tubes are used; and it may be either a single chamber, as above shown, or it may be divided into two or more distinct chambers, the division being formed into a water-space or otherwise.

## PROCEEDINGS OF THE BRITISH ASSOCIATION.

The Annual Meeting of the British Association is this year held at Liverpool for the second time. The new President, Lord Harrowby, opened the business of the session with an exceedingly appropriate address, from which, as reported in the *Athenæum*, we make the following extract:

"It cannot be for nothing that the heroes of every branch of science are assembled from many countries within these walls, and are brought into personal contact with the most enterprising and public-spirited of our merchants; that, in the language of my distinguished predecessor in this chair—slightly adapted—'the counting-house is thus brought into juxtaposition with the laboratory and the study.' Commerce will more than ever be auxiliary to science, and science more than ever the helpmate of commerce, and a still further impulse will be given to those beneficial influences which, in spite of some painful, though necessary interruption, occasioned by our present state of war, a good Providence is so visibly extending over the whole habitable globe.

"It is happily becoming every year less and less necessary to press these things on public notice. In an age of gas and steam, of steam engines and steamboats, of railroads, and telegraphs, and photographs, the importance of science is no longer questioned. It is a truism—a commonplace. We are far from the foundation days of the Royal Society, when, in spite of the example of the monarch, their proceedings were the ridicule of the Court; and even the immortal Butler thought the labours of a Wallis, a Sydenham, a Harvey, a Hooke, or a Newton fit subjects for his wit.

"It is still, however, worth inquiring whether sufficient facilities for education in science exist or are in progress in our country; and whether Government or other important bodies provide sufficient encouragement and reward for its prosecution.

"Now, in regard to the former, there can be no doubt that, until a very late period, the assistances to scientific education furnished in this country, either by educational institutions or the State, were very slight, and totally unworthy of the object or the nation. Look at the lower schools: until very lately nothing but reading and writing, and hardly that, was ever offered to the labouring classes. Look at the grammar-schools: they were limited to the acquisition of a small modicum of Greek and Latin, often not even of arithmetic. The middle classes of society, those who did not send their children to the universities, had no opportunity of acquiring any, the slightest, knowledge of science, whether practical or ab-

stract, from the untested, ill-respected teachers at private commercial schools, or from the casual visit of an itinerant lecturer, with his travelling apparatus. But what did the universities? My own university, Oxford, to which I acknowledge in other respects the highest obligations, did little for physical science. True, that the study of mathematics, as an exercise and training of the understanding, received its honours there, though the genius of the place has never yet been favourable to the pursuit. True, that until comparatively a recent period, the honours of the sister university were exclusively, or nearly so, confined to the same science; and that the school of Newton has seldom been without names not unworthy of such a founder. But even there the mathematics were still too exclusively regarded as a mere training of the understanding, and not as an instrument for the discovery of further truth; and the fair tree of science planted within the academic courts, though healthy and vigorous, was somewhat barren of fresh fruit. Such as it had been in the time of Newton, such, in a great degree, for a century and a half, at least, it remained. But to other than mathematical science, I believe I may say at either university encouragement there was little or none. If now and then a professor was to be found whose title promised something of the kind, on approaching him you would find that his existence was little more than nominal; that his courses were not frequented, even if they were offered; or if at all, only by those who were considered rather as the idle men, because success in them was not only no advantage in the university career, but, by the time which they abstracted from the rewarded studies, was a positive loss and obstruction in the way of the honours and emoluments of the place. So that it might fairly be said, that if any advance was made in such sciences, at least in the universities of England, it was rather in spite of than by reason of the system pursued in those otherwise useful, noble, and magnificent institutions. In Scotland, indeed, the extended study of medicine, connected as it is with so many other branches of science, together with the less amount of artificial forcing into other studies, led naturally to the pursuit of physical science, and a Black and a Gregory, a Leslie, and a Playfair had no rival contemporary names at Oxford and Cambridge. The names of a Whewell and a Herschel, an Airy, a Challis, and a Sedgwick, of a Powell and a Daubeny, and a Buckland,—alas, that he is now a name only,—would forbid the assertion in regard to more recent times. But what, meanwhile, was the State doing? That State which, with its limited population and territory, depends not upon the number of its people, but upon the individual value of each man—not upon the number of its acres, but upon their skilful cultivation,—not even upon the resources of its surface, however well developed, but upon the mines which lurk beneath it,—not even upon its mines, but upon all the various and varying manufactures which these mines give extraordinary facilities for carrying on; not even on these manufactures, but on the extended commerce and navigation which are necessary to provide the materials to draw them forth from the remotest corners of the earth, and to send them back with speed, safety, and economy, in another form and combination, often to the very spots from which they were derived; in a word, dependent for the full developement of its agriculture, its mining industry, its manufactures, and its commerce, upon the widest extension and the fullest cultivation of chemistry, of natural history, of mineralogy, of geology, of astronomy, of meteorology, and mechanics. What did the State do for these things? Why, absolutely nothing. There was for a time a Board of Longitude, which, instead of enlarging and improving, it abolished; a Board of Agriculture, which it dropped; a School of Naval Architecture, which, at the bidding of a narrow economy, and at the instance of practical men, it abolished when the fruits were ripening; a School of Naval Instruction, at Portsmouth, which it dropped. Here and there still survives a grant from the bounty of an individual monarch, grudgingly adopted by the State, of £10 for a professor of natural philosophy at Aberdeen, or 50 guineas for a similar professor at St. Andrew's, or £150 to one at Glasgow, or £30 to one at Edinburgh; and, more recently, grants of £100 a year each to four or five professors in each of the old universities of England. This is, as far as I can discover, all that the magnificent State of Britain did, until recently, for that science on which her wealth,—and if her wealth, her power,—and if her power, her very existence,—is dependent. True, one advantage we have enjoyed, which is indeed worth all the organized instruction in the world which despotism could offer—'although no science, fairly worth the seven,'—we have enjoyed security for life and property; the free exercise of thought and action; religion, which does not chain the energies of mind and character, but stimulates and exercises, while it regulates and directs them; and, though last, not least, a country to be proud of, and to be fond of, and which every one desires to bequeath to his posterity better, more beautiful, and stronger than he found it. And it is by reason of this indirect influence on national

character, that, in spite of the more than want of encouragement of science of which our Government has been guilty, England has yet to boast of an array of men of science, of workers and discoverers, if not always of teachers, such as she need not be ashamed to show by the side of any other country, whatever stimulants or encouragements its Government may have supplied.

"But, because so much has been done by the spontaneous vigour of the people's character and of their political and religious institutions, without special assistance or encouragement, does it follow that still more would not be done with those aids? Such, happily, is not the opinion of the present day,—not the opinion of the legislature,—not that of our universities themselves. We do not believe that such difficulties are an advantage even to the vigour of the plant, still less to its extended propagation; and, accordingly, individuals, colleges, and, I hope, governments, are now heartily and honestly engaged in repairing the defect of centuries, and not only in promoting the general development of intellect, but especially in directing it to the fields of science. And, happily, the facilities for the purpose already at hand are enormous. The Chancellor of the Exchequer need not apprehend excessive demands upon his treasury to meet the case; though, if they were necessary, I believe he is too sensible a man to withhold them; but such demands are not required. The encouragements and assistances already given by the State to the education of the people, in various shapes; the superior class of trained and examined teachers who are spreading over the land, and whose training has in no small degree been in physical science; the books provided for early education by our societies and by individual enterprise having the same character; the every-day more and more acknowledged connection between agriculture and science, showing itself in such papers as enrich the pages of the *Journal of the Royal Agricultural Society*; the establishment of the Department of Science, with its School of Mines, under the Board of Trade; the improvement which is to be expected, under the action of the Charity Commissioners, in the system of our old grammar-schools; the spontaneous action of our old universities, not superseded, but facilitated and stimulated by parliamentary interposition. These, and such like changes which are taking place, partly within the bosom of society itself, and partly by the action of Government, will shortly provide such means of scientific education, although not systematized with the exactness of continental organization, as will, after our rough English fashion, adequately provide for all our wants in that respect, and give us no cause to lament over any considerable deficiencies in practical result.

"But will there be encouragement to make use of these facilities? Are there rewards in prospect, whether of direct emolument or social consideration, which will induce men 'to wear out nights, and live laborious days,' in a service which has hitherto, in the world's eye at least, appeared often to be ill requited? Now, the real stimulant to science has at all times been the delights of the pursuit itself, and the consciousness of the great services rendered to humanity by every conquest within the domain of truth; but still these questions may fairly demand an answer. To the questions of pecuniary rewards I will presently advert; they have certainly been miserably inadequate: but in regard to social consideration, I think there has existed some misunderstanding. It has been often asserted, and been made the subject of lamentation or complaint that men of science do not enjoy in this free country the consideration which they do in some countries less favoured otherwise in their institutions than ourselves. Now, if by this it is intended to express that men of science are not made Knights of the Garter, or Peers of Parliament,—that they are not often met with in the haunts of wealth and fashion,—that they are not called into the councils of their Sovereign, or sent to represent her in foreign courts, I admit the fact; but, then, I doubt whether these are the natural or fitting objects of ambition to the scientific man; and, if it is intended by the assertion that they are not, as a class of individuals, appreciated by their fellow-citizens for their genius and honoured for their services, I cannot so fully admit the fact. I would ask any of those whose presence adorns this meeting, do they not find that their names are a passport into any society, the proudest of the land? Whose doors, that are worth entering, are not open to them? There are certain advantages, superficially considered, which will always belong to mere wealth or power; but are they such as the lover of science can bring himself to envy or desire? Wherever he is known, he is honoured; witness in themselves the meetings of this great Association, and of other kindred bodies, who visit, from time to time, different quarters of our land. Where is their presence not hailed, not struggled for? Where is it not the endeavour of rank and wealth on every such occasion to do honour to itself by showing honour generally and personally to those who, by their successful pursuit of science, have done honour to our own or foreign lands? If, indeed, there be anything yet wanting in this respect, either in our people or our Government, the progress of educa-

tion in science, to which I have before alluded, will soon supply it when the various classes of our population, in their schools, their mechanics' institutes, and, not least, in their colleges, are themselves less ignorant of science; when they have learnt to appreciate its value by personal acquaintance with its truths, there is no fear that those at whose feet they have sat—whose names are familiar to them in association with so valuable an acquisition—will not receive all due honour and regard. Whether, or to what extent, the result will be a greater association of science with political position, and how far such association would be advantageous to either politics or science, is another question. The experience of foreign countries on this head can hardly be held to be quite satisfactory. I am not sure that their men of science have been very successful politicians, or that science itself has profited by the union. Public life, more than science, is a jealous mistress, and does not well tolerate a known devotion to any other pursuit. It has, besides, a science of its own, essential to it, especially in a free country—the knowledge of men; and this is not always the special gift of men of science, who deal less with men than with things and thoughts; and I am not sure that the qualities which fit a man for success in the one pursuit are peculiarly advantageous to him in the other. This, however, is certain, that those who administer the affairs of this country ought, at least, (I do not think as yet they do) to know enough of science to appreciate its value, and to be acquainted with its wants and with its bearings on the interests of society; but such knowledge, I cannot doubt, will soon become the common appanage of all well-educated men; and when it is so, as I said before, whatever, either in the position of science or of men of science, is still wanting, will soon be supplied.

"To accelerate, however, this process, I would gladly see a more direct communication established between the organs of power and scientific bodies. Something in this respect has already been done by the Parliamentary Committee of this Association, and the results have been already seen in the increased attention of Parliament and Government to scientific objects. Still, however, in regard to science, I must admit that there is one great deficiency. For often may it be said of science, as it was said satirically of virtue by the poet, *Laudatur et alget*—It is praised and starves. The man of science may not desire to live luxuriously; he may not, nor ought he, desire to rival his neighbours in the follies of equipage and ostentation, which are often, indeed, rather a burden imposed by the customs of society than an advantage or even a gratification to the parties themselves; but he must live, and for the sake of science itself he ought to be able to live, free from those anxious cares for the present and the future, or from the calls of a profession, which often beset and burden his laborious career. Why was our Dalton compelled to waste the powers of such an intellect on private teaching? As a teacher, a physician, or a clergyman, or more rarely as a partner in a profitable patent, such a man may earn a competence, and give to science the hours which can be spared from his other avocations; and it is indeed astonishing what results have been the produce of these leasings of a laborious life—these leisure hours, if so they may be called, of men who are engaged in arduous duties of another kind. But this ought not to be; and it will not long be, I am confident. It must give way before the extended cultivation of science itself. The means of occupation in connection with our schools and our colleges, and our examinations, will increase; and I cannot but hope that a grateful country will insist upon her benefactors in science receiving a more liberal share of her bounty than has hitherto been allotted them. If I recollect right, out of the £1,200 which are annually appropriated in pensions to the successful cultivators of science, literature, and art, a poor pension of £50 is all that last year fell to the lot of science; and in former years the disproportion has often been little less remarkable. I do not grudge their share to literature and art; but I confess I cannot but consider that the labours of science are at least of equal value to a nation's welfare; that they have at least an equal claim upon her gratitude; and I am sure that they stand in no less need of encouragement and support.

"Nor have I any fear that the study of science should ever become too exclusive—that is, should make us too material,—that it should overgrow and smother those more ethical, more elevating influences which are supposed to grow from the pursuit of literature and art.

"In the first place, the demands of science upon the patient and laborious exercise of thought are too heavy, too severe, to make it likely that it should ever become the favourite study of the many. In art and literature the mind of the student is often comparatively passive, in a state of almost passive enjoyment of the banquet prepared for him by others; in those of science the student must work hard for his intellectual fare. He cannot throw up his oars,

> 'And let his little bark, attendant sail,
> Pursue the triumph and partake the gale;'

but he must tug at the oar himself, and

take his full share in the labour by which his progress is to be made.

"Nor, indeed, when I read the works of a Whewell, and a Herschel, and a Brewster, a Hugh Miller, or a Sedgwick, and a hundred others, the glory of our days, can I see any reason for apprehending that the study of science deprives the mind of imagination, the style of grace and beauty, or the character of its moral and religious tone, its elevation and refinement."

The following are abstracts of some of the papers read in the Mechanical and Chemical Sections:

"ON NAVAL ARCHITECTURE.

"The President (Mr. Scott Russell) gave, before a very large meeting in the mechanical section, a lecture upon the progress of naval architecture and steam navigation, including a notice of the large ship of the Eastern Steam Navigation Company. It was mainly in respect to speed that the great improvements in the last twenty years had been made. Within that time, the principle and the means of gaining speed had become definitely known, and this Association had had a great deal to do with the establishment of that principle, which consisted mainly in the particular formation of the water lines of the vessel. The old ships had a round, bluff, duck's-breast bow, with a sloping narrow stern. At length the idea was arrived at of making a boat with a bow, the water lines of which should correspond with the wave of the sea itself, which should gently and gradually divide the particles of water, which would then give a quiet and easy passage to the vessel entering, whether propelled by steam or by sails, without resisting their progress, and heaping a mound of water before the bows, as in the case of the old bluff, round-built vessels. It seemed now to be universally admitted in Europe and in America, that if a shipbuilder wanted to have a very easy and fast-going ship, he must give her bow, not the round convex line formerly adopted, but a fine, long, hollow line, such as the meeting might observe for themselves in all the recently-built vessels. Practical men, when they desired to build a fast ship, saw that they must now no longer use the convex water-line, but they must build with a hollow water-line at the bow; and in this consisted the great revolution which had taken place during the last twenty years. Whereas formerly the broadest part of the vessel was only a third part from the bow, the broadest part was now nearer to the stern than to the bow in the proportion of two to three, so that the shape of the ship under the water was very nearly reversed. The ship, out of the water, might remain very nearly the same; but where she cut the water, the lines were as he had described. It was on this principle that American clipper ships and English ships, which happened to be very fast, were built; and upon which he would say, without fear of contradiction, every vessel, to gain anything like 16 miles an hour, must be built. Now there was, in addition to this, another very important principle which had been discovered; that was, the virtue of the length. It used to be a dogma, in the time of his pupilage, that no steamboat could ever, by any possibility, go faster than nine statute miles an hour. He was born and bred in that belief. Nine statute miles an hour was the creed of his instructor in shipbuilding. At that time they had very short vessels, and they endeavoured, by putting enormous power in them, to compel them to go through the water whether they would or not. He remembered being present at the trial trip of a vessel, out of which had been taken 50-horse power engines, and engines of 70-horse power substituted. It was a most extraordinary fact that she only gained something like a quarter of a knot an hour by that enormous addition to her power and fuel, because she had not sufficient length to go by any force at a high speed; and the more she was driven through the water, the greater was the resistance made by the water which she raised before her. The principle was ascertained, that, if you wanted the particles of water to go out of the way of the vessel when going very fast, you must give the particles more time to do so. Now, this might appear a contradiction in terms; but the faster the vessel was to go through the water, the more time must be allowed to the particles of water to give way. It was found that it was more easy to push a vessel with an elongated body through the water, at great speed, than the short vessels which had been in use. This was reduced to a regular principle, the result of which was, that it was now certain that 24 feet of length in the entrance lines of a vessel would give eight miles an hour easily; to go at 16 miles an hour, the entrance lines should be nearly 96 feet long. To give 24 miles an hour, the entrance should be 216 feet long; so that they could not expect to get 24 miles an hour until they had made up their minds to build ships something like 400 feet long. From all the experiments he had made, and had seen made, these facts were undoubted. The clipper ships and fast steamers had lengthened their bow-lines until they had got the necessary length for speed; and if those present looked at any vessel which had got the reputation of going 16 miles an hour, he believed they would find that to be the fact. Indeed, he did not believe

there was in existence a vessel shorter than 180 feet which could go 16 miles an hour, and if there were any such vessel forced to go more than 16 miles, it was at an expenditure of power which was perfectly preposterous. They would, therefore, perceive why such a large vessel as the *Himalaya* had such great speed. The *Himalaya* had a length of 350 feet, and should have the greatest speed for the smallest power of any merchant vessel hitherto. If, in a like manner, they looked at the large clipper ships of 2,000 and 3,000 tons' burden now built, they would find that the principle was taken advantage of, and that their bows were elongated to a great length. But what else was being done? The owners of the clipper ships were finding out that, by the lengthening of the bow and making the lines more hollow, they could reduce the sails and spars, and yet preserve their speed, finding that the ships could now do in the water what force of canvas could never alone accomplish. Like every truth, the shape of a vessel had been long since found out and lost again. The old London wherry was built as perfectly upon the lines he had described, as if it had been mathematically constructed upon them. In India the boats were made precisely upon that form, and they were the fastest boats in the world, as a class. The Turkish caiques had the same shape, and they were very fine vessels. In Spain they had arrived by some means at a form not very different, and throughout the whole of the last war the Spanish vessels were the best vessels, and the best England took. The smugglers, because they risked their necks upon the speed of their ships, quickly found out what shape was best, and some of the most beautiful ships that ever came into our possession in that way were built in that form. The Americans had made very early an experiment of the kind in steamboats. They lengthened their steamers at a very early period, and they now generally built upon this plan and with the hollow lines. They had done wonders in this way, and he believed in England wonders were also being done. It was not easy to carry the elongating of the vessels much further in wooden ships, because they could not get timber large enough, and it was impossible to make it strong enough by joining; but he believed Professor Fairbairn had discovered the means of joining iron so as to make it equal in strength to solid metal. Having alluded to the building of the *Great Western*, and subsequently of the *Great Britain*, and the prophetic doubts expressed at first regarding the fate of each, the speaker proceeded to describe the great vessel now being built by him upon the Thames, for the Eastern Steam Navigation Company, to trade with India and Australia. He showed how the difficulty of carrying coals, and having to stop for them and buy them at high rates at St. Vincent and the Cape of Good Hope, and sometimes the Mauritius, created such an expense that no freights could cover; he showed how it became necessary to construct a vessel large enough to carry her own coals all the way. When, therefore, he told them that the vessel being constructed was expected to make the voyage to Australia in 30 days, carrying a sufficient freight, with 600 first-class and 1,000 second-class passengers, having three large tiers of decks, eight feet each in height—that she was 675 feet long, 83 feet beam, 60 feet deep—when he told them that he had just measured St. George's-hall, and found that it would not fairly represent this ship, being only 169 feet instead of 675 feet long—that up to the top of the hall it was only 82 feet high, and up to the spring of the arch about the height of the ship—that the breadth of St. George's-hall was only 77 feet, being 6 feet narrower than the hold of the ship,—it would give them the nearest approximation he could convey to the size of the vessel. Mr. Russell concluded by a prediction, in eloquent terms, of the glorious effects to civilization which would ensue from the noble rivalry existing at present among individuals and nations in the advancement of science. In reply to a question afterwards put to him, he stated that the huge vessel which he had described would draw 20 feet when light, and 30 feet loaded.

"Mr. Fairbairn had no hesitation, judging from the drawings he had seen, and from the principle of the vessel, in saying that she would be perfectly suitable, strong, and calculated to carry out the object for which she was designed. When they were able to construct the Britannia bridge, 460 feet long, without any support in the middle, and could run a train through it, there could be no doubt that such a vessel as had been described could carry the weight and resist the opposition necessary.

"ON THE VENTILATION OF EMIGRANT SHIPS.

"Mr. J. Cunningham read a paper upon this subject, which excited some attention among the shipowners of Liverpool. He said, it was a fact acknowledged by all men practically conversant with the general condition of emigrant ships as respected ventilation, that the means usually employed were wholly inadequate for affording a constant and sufficient supply of pure air to the parts of a vessel occupied by emigrants, or for conveying away from them at the same time the vitiated air. The want of such

means was painfully experienced by the emigrants even under ordinary circumstances, but more particularly was the want felt during calms and hot weather, when scarcely a breath of pure air could be conveyed into the cabins and holds, and when the vessels were crowded with human beings, as emigrant vessels usually are, in spaces proportionally less than the law allows for the commonest lodging-houses. In rough weather also, when the port-holes were closed and the hatches battened down, the condition of the emigrants became infinitely worse, for to the fetid atmosphere which they were compelled to breathe were superadded consequent sickness, fevers, and other cognate evils. These consequences, frequently fatal, arising to the poor creatures from such a state of unfavourable conditions, were too well known to require particular illustration. An example or two, however, might be given of the fatal effects, which, if not directly produced, were certainly greatly aggravated by a want of the means for proper ventilation, and for disinfecting the vessels. He referred to the ship *Dirigo*, which lately sailed from this port for Australia with emigrants, and in which, two days after she left the port, cholera broke out, and carried off forty-two passengers. In a letter published in the *Times* of the 1st of this month, an account was given of the horrible condition of the men in the Government ships now in the Black Sea, where the cholera broke out during stormy weather, when the hatches were battened down and the port-holes closed. The fetid state of the atmosphere in these ships, from a want of ventilation, and the frightful mortality that ensued in consequence, were most graphically described in that letter. These cases were sufficient to illustrate the defective ventilating means employed on board, not only of merchant vessels, but even the best appointed men-of-war or Government ships. It might be safely asserted that no efficient system of ventilation could be carried out in ships by any other than a motive power proportioned to the requirements of the number of people on board. All other means, such as wind sails and open ports, at present employed, could only be but partially effective, and could not either at all times be made available. The scheme which he (Mr. Cunningham) suggested for effecting those vital objects on board a vessel was illustrated by drawings, and had been made the subject of a patent. By the application of this power a constant and most effective method of ventilation could at all times be carried on. In combination with it also, was a simple process of disinfecting a ship (should an infectious distemper break out) in a most effective and rapid manner, and, had the ship *Dirigo* or the Government ships in the Black Sea been provided with the means for ventilating or disinfecting them which his scheme embraced, the probability was that the cholera would not in either case have made its appearance; or, at all events, its virulent character would have been greatly mitigated and the mortality considerably lessened. A statement appeared in a late number of the *Medical Journal* of the salutary effects produced by the use of the chloride of zinc as a disinfecting agent among patients labouring under yellow fever, showing that where the chloride was used five per cent. only of the patients died, whereas, where it was not used, thirty per cent. died. The recovery of the patients was also greatly promoted by the use of the disinfecting fluid. The plan of the engine shown by Mr. Cunningham to the section was calculated at 3-horse power, and was sufficient to thoroughly ventilate a ship of 1,500 tons burden, containing 600 persons, and to afford to each person three cubic feet of pure air every minute. This supply is effected by two fans, performing 450 revolutions in a minute, thereby forcing the air down the main air-shaft to the side trunk flues, which extend along each side of the vessel. Small branch flues to the cabins and other parts of the ship requiring ventilation are joined into the main trunk flues, each being provided with sliding or revolving ventilators to regulate the requisite amount of supply. One vessel is employed for disinfecting or for cooling the atmosphere, a tank is charged with water containing the disinfecting fluid, and the truncated cone, which is termed 'a spray,' is inverted with its smaller end into the fluid, its upper end spreading out, and being perforated. This vessel rotates rapidly, and the fluid, by the centrifugal force, is drawn up and thrown out in spray, through which the air must pass into the fanners, thus becoming impregnated in its passage with the disinfecting material, such as the chloride of zinc or of lime. By placing a few bucketfulls of ice per diem in the tank, the water may be cooled to a low degree, and consequently the air must be reduced in temperature in like manner. This may be applied in the tropics, or when required. The cost of providing a steam-engine, boiler, and apparatus complete, including flues, &c., for a ship of 1,500 tons burden, similar to the plans exhibited, was estimated by the lecturer at between 250*l.* and 300*l.* The quantity of fuel required to keep the engine at work night and day for 100 days would be about 20 tons. In addition to the process of ventilation, it was proposed also to adapt the engine to several other purposes,

such as the loading and discharging of the vessel, lifting the anchors, pumping the ship, supplying water to the water-closets, and for cleaning the decks; and besides this, it was proposed to apply the waste steam to the purposes of cooking.

"ON THE VARIATION OF THE MAGNET.

"Sir J. Ross noticed, 'with no less reluctance than concern,' that the very elaborate article in the *Admiralty Manual* on the subject of the variation of the magnet, was completely at variance with that on the same interesting topic by the Swedish Baron Wrede. This, he said, might be satisfactorily accounted for by the total disregard of solar and artificial light in the various observations which had been made and published in the *Admiralty Manual*. Consequent on information he had given to Baron Wrede of the discovery he had made of artificial light having the power of amalgamation with magnetism, the Baron totally excluded light from his magnetic observatory, with the exception of a subdued light at a considerable elevation vertical to the horizontal needle, while the arc was read off by a telescope, at a distance of several yards from the instrument. It was evident that the more deliberately the magnetic needle was suspended as described in the *Admiralty Manual*, the more obnoxious it would be to the effect of artificial light in the operation of reading off the instrument. This would fully account for the many discrepancies therein mentioned, and it was to be hoped that in future due attention would be paid to the fact discovered by Sir John Ross, and since fully corroborated by Professor Tweedie, of which discovery the author of the article in question appeared to have been totally ignorant. Baron Wrede would, it was stated, in due time publish his observations, which would, no doubt, be transmitted to the Astronomical Society. In proof of the effect of every description of light on the magnet, Sir John mentioned, that during his last voyage in the *Felix*, when frozen in about 100 miles north of the magnetic pole, he concentrated the rays of the full moon on the magnetic needle when he found it was five degrees attracted by it.

"ON THE ACTION OF CERTAIN ORGANIC ACIDS.

"Professor F. Crace Calvert presented to the chemical section a paper on the action of citric, tartaric, and oxalic acids on cotton and flax fibres under the influence of dry heat and steam pressure. He observed, that when from two to four parts of these acids are dissolved in 100 parts of water, and that linen or cotton is dipped into the solution obtained, and afterwards dried in the air, they, on exposure to certain temperatures, completely destroy the tenacity of the fibre. This action of organic acids is interesting, when it is known that it takes place even at the low temperature of 180° F., 212° F., and 260° F. He also found that cotton-flax fibres, when prepared as above, and then submitted to the influence of steam of 8 lbs. pressure, were also destroyed. These facts will prove not only interesting to calico printers, who employ large quantities of these acids, but also to the medical man, who often prescribes to his patients calves'-foot jelly as made by confectioners, which, in reality, generally consists of isinglass clarified by tartaric acid.

"The same gentleman communicated a paper on the uses of carbo-azotic acid. After having described the process by which pure carbo-azotic could be procured from carbonic acid, he impressed upon those present the value of this pure acid, in silk dyeing, as a much finer straw colour could be obtained by employing it."

## MATERIALS FOR PAPER MAKING PROCURABLE FROM INDIA.

Paper, it is well known, is in Europe made chiefly from linen or cotton rags, but also from the refuse and sweepings of cotton and flax mills, as also of the coverings of our cotton bales and of worn-out ropes. But paper is also made from the stems and leaves of many grasses, as from rice-straw, and from the bamboo by the Chinese, and of late from common straw in this country, and even from wood shavings. The fibrous part of many lily and aloe-leaved plants have been converted into excellent paper in India, where the fibres of tiliaceous, malvaceous, and leguminous plants are employed for the same purpose. As in the Himalayas, one of the lace-bark tribe is similarly employed, and in China one of the mulberry tribe, and the nettle in Holland. I mention these various sources, because plants belonging to the same families as the above abound in India and other warm countries, and are capable of yielding a very abundant and never-failing supply of sufficiently cheap and very excellent materials for paper-making of all kinds. Some may be used without any further process of bleaching, but all are capable of having any colour they may possess destroyed by chemical means, as I would not even except the jute canvas or gunny bagging, because I have seen specimens of jute of a beautiful silky white, both plain and manufactured into fabrics for furniture, &c., as shown by the late Colonel Calvert at the East India-

House. As the Chinese make paper of rice-straw, and of the young shoots of the bamboo, while the Hindoos make ropes of different grasses (such as Saccharum munja, and Saccharum sara), strong enough for their Persian wheels as well as for towing-lines, it is evident that these, and probably many others, contain a sufficiency of fibrous material for paper-making. The cultivated cereals cannot well be turned to much account, for their straw forms the chief food for cattle; but as the country abounds with grass jungles, which are in the autumn of every year burnt down in order that the young blades may spring up and afford pasturage for cattle, it is evident that there are many situations where a sufficiency might be cut down before it has become perfectly dried up, and converted into *half-stuff* for paper-makers.

Of the sedges also some are employed in India for making ropes, as the Bhabhur or Eriophorum cannabinum, for making rope bridges for crossing some of the hill torrents. The papyrus, we know, was used by the Egyptains for making their paper; but this was by cutting the material into thin slices and making them adhere together under pressure. But others of the genus, as the Cyperus tegetum, is used in India for mat-making. As these plants, as well as rushes grow together in large quantities, it would be quite possible in many places to turn them to profitable account.

Many parts of the world abound in the lily and aloe-leaved plants which have been alluded to above, and of which the leaves contain much easily separable fibrous materials. These belong to the genera Agave, Aloe, Yucca, Sauseviera, Bromelia, and others, all of which abound in white-coloured fibres, applicable to various useful purposes, and of which the tow might be used for paper-making, and considerable supplies obtained. Paper used to be made from the Sauseviera in Trichinopoly, and some made of the unbleached Agave alone, and also mixed with old gunny bags.

Among cultivated plants there is probably nothing so well calculated to yield a large supply of material fit for making paper of almost every quality as the plantain (*Musa paradisiaca*), so extensively cultivated in all tropical countries on account of its fruit, of which the fibre-yielding stems are applied to no useful purpose. The plant, as every one acquainted with tropical countries knows, is common near the poorest huts and in the largest gardens, and is considered to yield by far the largest quantity of nutritious matter. Its fruit in many places supplying the place of bread, and in composition and nutritious value approaches most nearly *to the potatoe*, may, if produced in too large a quantity, be preserved in the same way as figs, or the meal may be separated, as it resembles rice most nearly in composition. Each root-stock throws up from six to eight or ten stems, each of which must be yearly cut down, and will yield from three to four pounds of the fibre fit for textile fabrics, for rope-making, or for the manufacture of paper. As the fruit already pays the expenses of the culture, this fibre could be afforded at a cheap rate, as from the nature of the plant, consisting almost only of water and fibre, the latter might be easily separated. One planter calculates that it could be afforded for 9*l.* 13*s.* 4*d.* per ton. Some very useful and tough kinds of paper have been made from the plantain, and some of finer quality from the same material in France.

All the plants which have been already mentioned are devoid of true bark, and are called endogenous in structure. Simple pressure between rollers, and washing, would appear to be sufficient for the separation of the fibres of most of them. But the following families of plants are all possessed of true bark, which requires to be stripped off usually after the stems have been steeped in water, before their respective fibres can be separated from the rest of the vegetable matter.

The flax plant abounds in fibre, but this is too valuable to be converted into paper. India, however, grows immense quantities of the plant on account of its seed (linseed), which is both consumed in the country and exported in enormous quantities, but nowhere is the fibre turned to any account. This is no doubt owing to the climate not favouring the formation of soft and flexible fibre; but the short fibre which is formed, and might be easily separated, would be valuable for paper-making, and might add to the agriculturists' profits without much additional outlay.

So some valvaceous plants are cultivated on account of their fruits, being used as articles of diet, as the Okhro (*Hibiscus esculentus*) of the West Indies and of the United States. The *Ramturai* of India is closely allied to it, and is cultivated for the same purposes. Both plants abound in fine flexible fibre, which is not, but might be easily, separated, and afford a considerable supply, especially if the cultivation was extended in the neighbourhood of towns. Paper is made from a species of Hibiscus in Japan, and *Hibiscus Sabdariffa* is cultivated in India, on account of its jelly-yielding calyxes. Numerous other species of Hibiscus, of Sida, and of other genera of this family, abound in warm climates; several are cultivated in different countries, as *Hibiscus Canabinus* in India, and *Sida Tiliæfolia* in

China; more might be so. They grow quickly and to a large size, and abound in fibrous material of a fine, soft, flexible quality, on which account they might be cultivated with profit, and the tow be useful to the paper-maker.

The Tiliaceæ are likewise remarkable for the abundance and fine quality of fibre which many of them contain. *Tilia Europea* produces the enormous quantities of bast exported from Russia. *Corchorus olitorius* and *Corchorus Capsularis*, the leaves of both of which are used as a vegetable, yield the large supply of jute imported into this country, as well as the gunny cloth and bags exported even to America. Several species of Grewia yield edible fruit, on which account they are cultivated. Others abound in the jungles, and most would yield a valuable fibre, as some of them already do, for commercial purposes. Some paper is made from gunny bags. Some of the Leguminosæ also abound in valuable fibre. *Crotolaria juncea* yields the common sunn of India. *Sesbania Cannabina* yields the dhanchi of Bengal; while *Bauhinea Racemosa* is used in making rope bridges in the Himalayas. The fibre of *Parkinsonia aculeata* was sent to the Exhibition in 1851, expressly as being fitted for paper-making; though colourless it wants strength.

Several plants produce large quantities of a silky, cotton-like substance, not applied to any use, such as the silk-cotton tree, the mudar of India, &c., several species of Saccharum, which might be collected where labour is cheap, and would no doubt be well fitted for conversion into pulp for paper.

Among the nettle, the mulberry, and bread-fruit tribes of plants, there are many which seem well calculated to yield material for paper-making. The Chinese, we know, employ the inner bark of morus, now *Broussonetia papyrifera*. This, no doubt, produces some of the Chinese paper, which is remarkable for toughness. I believe that the refuse cuttings of the bush cultivation of the mulberry in Bengal might be turned to profitable account. The barks of many stinging (*Urtica*) and of stingless (*Bohemeria*) nettles abound in fibres remarkable for strength; the tow of these might be converted into paper stuff if not required for mixing with wool.

The weeds of tropical countries, which grow in such luxuriance, and among which are species of sida, of grewia, of corchorus, of triumfetta, and of many other genera, might all yield an abundance of fibrous material if the refuse of the above cultivated plants was found not to be sufficient. Some simple machinery for separating the fibre would greatly facilitate operations, while the expenses of freight might be diminished by compression, or, as suggested, by packing the material as dunnage, and the cheapness of labour, as of everything else in many of these countries, would enable material for paper-making to be brought here in great abundance, and at a sufficiently cheap rate, if ordinary pains were taken by the consumers in Europe to encourage the planter or colonists of a distant region.—J. F. Royle.—*Journal of the Society of Arts.*

## ON ELECTRICITY AS A SOURCE OF POWER.

*To the Editor of the Mechanics' Magazine.*

Sir,—Among the various attempts that have been made to produce motive power from electricity, it does not appear that the current induced from a magnet, known as magneto-electricity, has been experimented upon. At the time that Jacobi, Davenport, Davidson, Taylor and others, brought out their electro-magnetic engines, it was little known, and no apparatus of great power had been made.

No experiments, that I am aware of, have been tried on a large scale to compare the power manifested in a well contrived electromotive engine by the current evolved from the rotation of a series of armatures surrounded by insulated wire, in the face of, or between the poles of large permanent or electro-magnets, with the power required to effect such rotation.

It seems opposed to our usual notions of force to believe that by the simple movement of machinery, a greatly increased force can be developed; but we cannot apply the general laws of mechanics to electricity, of which we know so little that even the first electrician of the age, whose researches have elucidated so much of the knowledge we possess, the gifted discoverer of magneto-electricity, has stated that the more information he acquires of the attributes and powers of electricity the more he becomes impressed with a consciousness of ignorance as to its nature.

Magneto-electricity is now employed for most of the uses that galvanic or *battery* electricity has been applied to. An important system of telegraph (where *intensity* effects are required) is entirely worked by it, at a great saving in the renewal of metallic plates, acid, &c., accompanying the use of voltaic batteries; and in electro-metallurgy (where, as in electro-motive power, *quantity* of electricity is necessary,) the advantages have been still more strikingly exhibited.

A number of large armature coils are fixed around the circumference of a wheel,

driven by the surplus power of a small engine, used for stamping the metal to be electro-plated, and other purposes.

The wheel rotates between the poles of powerful steel magnets; and a commutator, with some improvements on the old method, to render the otherwise intermittent current continuous, completes the machine, which performs its duties with the same efficiency as the old battery system, and at a small fraction only of its cost.

The force required to drive the wheel is not more than a quarter horse power, and the current from such a machine appears to be at least equal to that from the battery power employed in some of the electro-magnetic engines that are stated, by their inventors, to have upwards of one-horse power.

The difficulty in making electricity of service has been not so much the impossibility of obtaining increased power beyond that of any experimental engine that has been made, as the immense cost of maintaining batteries equivalent to the power far exceeding the cost of a similar force generated by steam.

Jacobi, in his experiment on the Neva, in 1839, used a Grove's battery of sixty-four cells, each having thirty-six square inches of surface; and in his trial the previous year more than five times greater batteries were employed.

In experiments alone with Captain Taylor's engine, in the same year, more than six cwt. of sulphate of copper were consumed in one week, without reckoning the proportionate decomposition of metal.

The consumption of zinc, the cheapest positive metal for voltaic batteries, is very considerable in a number of large cells excited by strongly acidulated liquids; in fact it is in exact proportion to the amount of current evolved, so long as the plates are in good condition; and when they become deteriorated the current is lessened, and the decomposition greater from the local action.

Therefore while zinc costs £30, and coal may be had for 10*s*. per ton, 8 lbs. of which generate one-horse power in an hour, voltaic electricity is quite out of the question as a means of obtaining motive power.

If one of the electro-magnetic engines now in existence was slightly modified in its coil arrangements, so as to be better adapted to the action of a magneto-electric current, and tried in respect to the power generated, and the power employed in moving the wheel of such a machine as I have mentioned above as used for electro-metallurgic purposes, (the proprietors of which, I should think, would afford every facility for the trial of so interesting an experiment,) the matter would be at once proved; and if any moderate excess of power could be obtained, it could easily be applied to any electro-magnetic engine that I know, in so obvious a manner as to render any suggestions on my part unnecessary.

I am not one of those who think the day is near for electro-magnetism to supersede steam, for I believe we have a great deal to learn before that can be hoped for; but for many small uses, such as turning lathes, grinding stones, working organ and smiths' bellows, propelling yachts, &c., an engine of low power, but requiring no extra hand to pay constant attention to it, and free from the noise, smoke, and danger attending steam, and always in readiness without any loss of time in getting up the power, would be an immense convenience and economy in many ways.

I am, Sir, yours, &c.,
CHARLES T. BRIGHT.

Liverpool, Sept. 30, 1854.

## AN IMPROVED AIR-PUMP.

*To the Editor of the Mechanics' Magazine.*

SIR,—Having for a long time regretted the many imperfections of the present form of the air-pump, I have endeavoured, as far as possible, to devise some method by which they may be, in some measure at least, obviated.

The principal objections to the air-pumps commonly used (viz., those furnished with a pair of cylindrical pumps worked by a toothed-wheel and racks,) seem to me to be these,—1. The great difficulty of construction. 2. Their expense. 3. Their liability to get out of order. 4. The frequent imperfection of the vacuum produced by that of the pumps. To remedy these inconveniences I send you this design, which I think at once combines the desiderata of greater facility of construction, of greater durability, and of diminution in cost. With regard to the vacuum, it is almost Torricellian. Hoping, therefore, that the accompanying will be an improvement on the former construction of air-pumps, I shall be exceedingly obliged by the insertion of it in your most useful and interesting periodical.

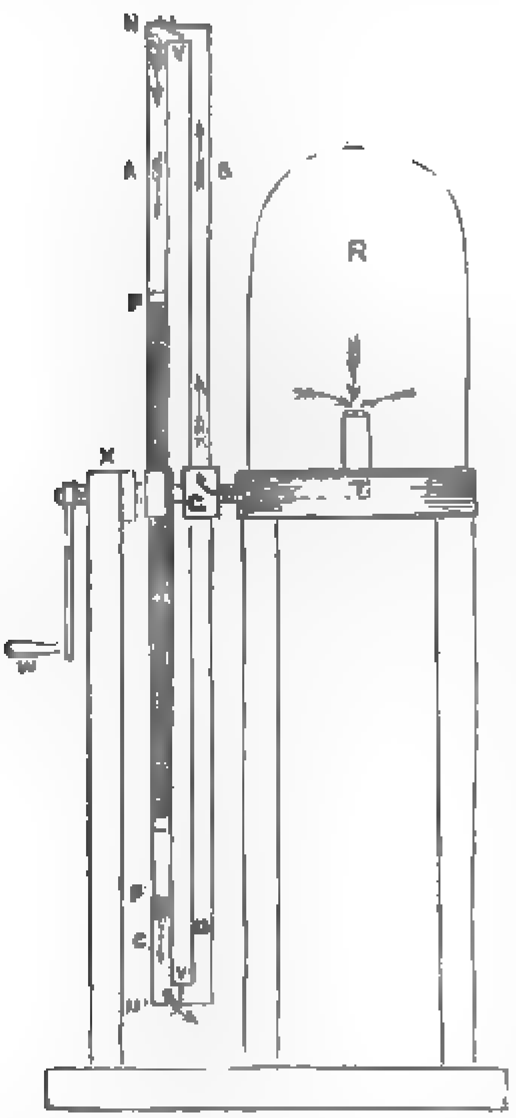
I remain, Sir, yours, &c.
H. T. S. HILLS.

58, High-street, Oxford, Sept. 19, 1854.

*Description.*

R is the receiver of the air-pump; T is a tube connecting the interior of the receiver with the rectangular tube, ABCD, which is furnished with interior valves, VV', opening outwards *from* the receiver, and exterior valves, NN', opening outwards *into* the atmosphere. The tube, ABCD is turned

on an air-tight collar, G, round the tube, T, by means of the winch, W. PP′ is a column of mercury, 33 inches in length, contained between the pistons, PP′, which are connected by a thin wire passing through the mercury, and which slide smoothly in the tube, AC. The valves, VV′, and NN′, are kept closed by weak springs. The action of this machine is as follows:—Let the column of mercury be supposed to occupy the space, NX, of the tube; it will




then descend, forming a vacuum above it, and being heavier than the atmosphere (33 inches), will force the air under it through the valve, N′, (the valve, V′, being closed) until the piston, P′, reaches the projections seen near the lower end of the tube, where it will be stopped. The air from the receiver will rush in the direction of the arrows through the valve, V, to fill the vacuum, after which the valve, V, will close. If now we reverse the tube by means of the winch, so that the other end of the tube, XN′, may be uppermost, it is evident that the same results will follow. Thus the operation may be repeated until the receiver is entirely exhausted.

## ON WATER AS A CONDUCTOR OF ELECTRIC CURRENTS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I am much obliged to your correspondent, Mr. Bright (page 301) for his kind endeavour to enlighten me on the subject of electric conductors. I thought I tolerably well understood the phenomena involved; and even supposing Mr. Bright's explanations to be correct, I do not see that he gives any answer to my question, why water is not *more* extensively used as a conductor? That it is even now extensively used is well known; currents have been sent through the Serpentine, across the Thames, and the Straits of Dover, by various experimenters, without any appreciable diminution of force. I cannot therefore admit that "the resistance offered to the passage of electricity through water is immense." But does the current pass *through* the water? Mr. Bright speaks of the *earth* circuit; but without water there could be no circuit; all the earths (not metallic) being non-conductors.

The explanation given by Mr. Bright of the circumstances attending an *earth* circuit, applies equally to a wire, or any other circuit; and although difficult to prove, is very likely a correct representation of what actually takes place; viz., that a sensation (say an atom of electricity) from the positive end of the battery displaces the next atom in the line of the conductors, which displaces the next, and so on throughout the series of conductors, wire, earth, and water, until the last atom displaced enters the negative end of the battery,—a process we familiarly designate *completing the circuit;* an operation which may be exemplified mechanically by a row of marbles lying in close contact. If another marble be forcibly driven against one end of the row, the shock will be transmitted through the series, and detach only the last one; or, as Mr. Bright illustrates it, by the drop of water added at one end of a tube, without passing through the entire length of the tube, displacing a drop at the opposite end. So that instead of an electric current passing the whole distance between London and Edinburgh and back again, it has merely received an impulse by a portion added at one end of the line, detaching, as it were, a corresponding portion at the other.

The fitness of any particular conductor for the purpose is altogether another question.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

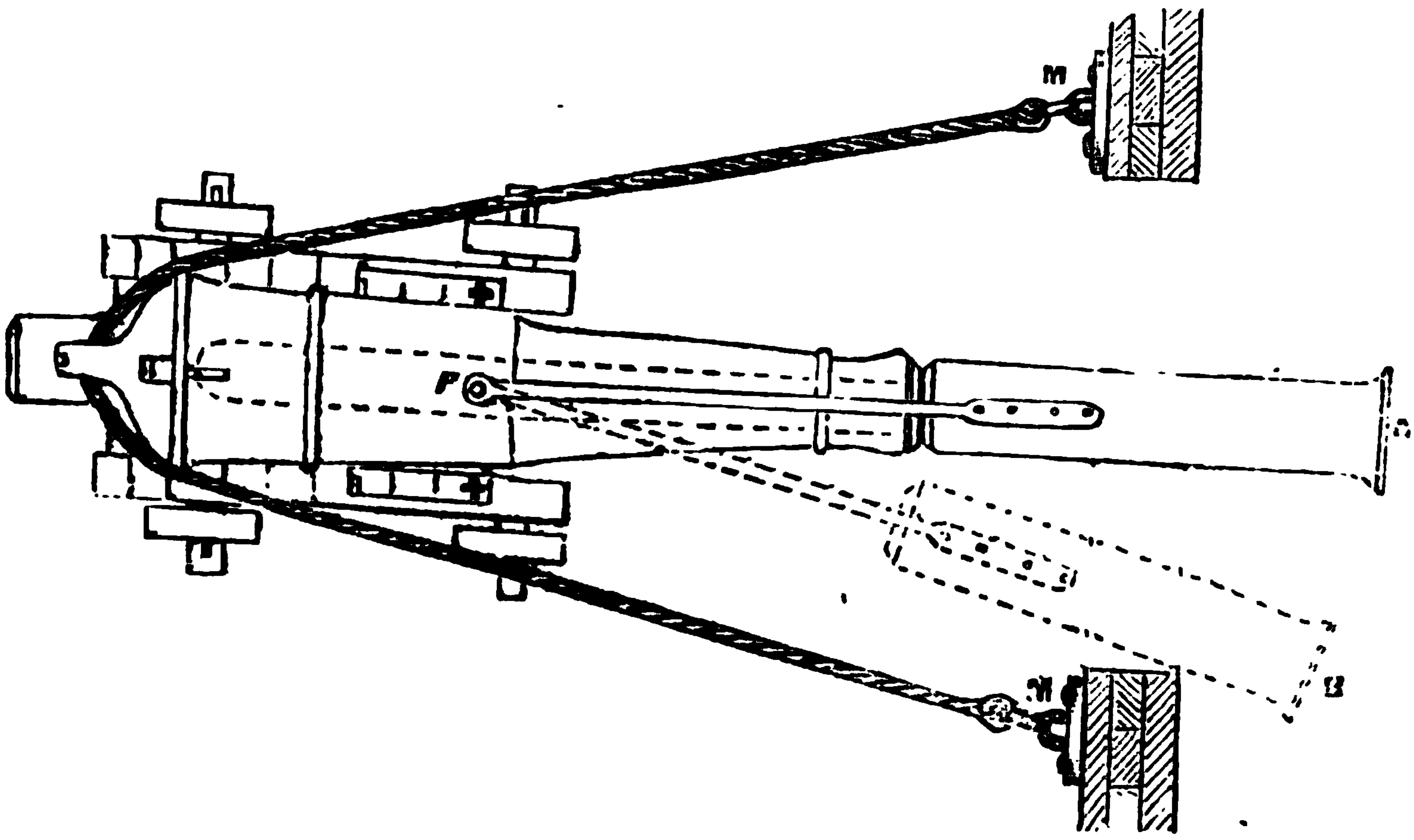
13, Angell-terrace, Islington, Sept. 26, 1854.

## LOADING CANNON ON BOARD SHIP.

*To the Editor of the Mechanics' Magazine.*

SIR,—A great deal of time and force is expended in loading cannon on board ship, owing to the necessity which exists for protruding the muzzle of the gun, when it is fired, so as to prevent the smoke returning into the ship.

It occurs to me that if the breeching of a gun were to be made elastic, the recoil of four or five inches would be sufficient, and that the elasticity of the breeching could be used to draw back the gun to its first position. Now, to enable the gun to be loaded and fired without requiring the muzzle to be drawn back and run forward, I would suggest the plan shown in the accompanying figure. Suppose we fix to the gun




a tin tube, A P, turning on a vertical pivot, P, and capable of being pushed to the position, B P, during the loading of the gun, and then returned to the position, A P; when the gun is fired, the gun's smoke will then be carried out at A, which may be styled the false muzzle; and thus the breeching fastened at M M need never be altered. It is plain that the addition required to effect this improvement is not costly, nor one which would need alterations in the ship's port or gun-carriage. Surely this is at least worth trial.

I am, Sir, yours, &c.,

J. M.

Temple, Aug. 26, 1854.

## DISCOVERY OF PERPETUAL MOTION IN AMERICA.

THE following is an extract from the *Times* of Thursday:

"Mr. J. G. Hendrickson, of New Jersey, announces the discovery of the principle of perpetual motion. The success is obtained by the employment of arms and balls attached to a cylinder so as to keep the extra weight always on one side, and therefore to give the cylinder a constant inclination to turn round. The machine requires no starting; take away the blocks, and it goes off 'like a thing of life.' The *Journal of Commerce* says of it—'The model was in our office yesterday, and attached to some clockwork, which it turned without once stopping to breathe. We see no reason why it should not go until worn out. After a careful examination, we can safely say, in all seriousness, that the propelling power is self-contained and self-adjusting, and gives a sufficient active force to carry ordinary clockwork, and all without any winding up or replenishing.'" (!!!)

## THE MUSEUM OF ORNAMENTAL ART.

THE Museum at Marlborough House will be re-opened on Monday next. During the recess the specimens have been re-arranged, and considerable additions have been made. The Collection of arms from the Royal Armoury at Windsor will continue to be exhibited. An alteration has been made in the days of admission. In future the Mu-

seum will be opened on Saturdays, which will be free days, instead of Tuesdays. This change has been made chiefly with the view of enabling the schools in the metropolis to send their students to visit the Museum on the afternoons of Saturdays.

## PORTABLE ENGINES FOR MINING PURPOSES.

MESSRS. Medwin and Hall, of the Blackfriar's-road, London, have suggested a new application of their patent portable engines, which seems likely to be attended with very useful results. It is almost universally admitted that for mining purposes generally, such as pumping, hauling, stamping, crushing, sawing, &c., steam is possessed of a considerable superiority over water as a source of power, except in cases where a good fall of water and a sure and unfailing supply of it can be obtained in the immediate neighbourhood of the works. As this, however, is rarely the case, recourse must be had to steam, and the only question then arising is, as to the manner in which this can be most economically made available. Under the present system of mining it is necessary, in commencing operations on a new set, to erect a stationary engine and other machinery, and this generally occupies a period of several months, and almost invariably overruns the original estimate considerably in the matter of cost,—so much so, indeed, that many adventures of high promise have had their works suspended, and even in some cases abandoned altogether, from this very cause. By adopting the use of portable engines, this impediment to mining enterprise is effectually removed; the engines can be transported to the works and set to work without loss of time, no building or other such preparations being necessary, and their cost being known to a fraction beforehand, is rendered entirely irrespective of all speculative contingencies. The portable engines manufactured by Messrs. Medwin and Hall for this purpose are constructed in a manner which fully sustains the reputation of the firm for this description of work. They can be had from four to forty horse power, and at the shortest notice, as the manufacturers have always a stock on hand to select from. The boilers are very strong, and built with a return flue; the cylinders are horizontal, and situated on the top of the boiler, on which is also placed the crank shaft, which is furnished with a fly-wheel and a rigger for communicating motion to any required point. The boilers are fitted with steam and water gauges of a superior description; and the engines are mounted on broad waggon wheels, for convenience of removal from place to place. The engines are, in fact, in every particular as complete as they can be made, and fully equal to the work they will be required to perform.

## SMOKE AS A PURIFIER OF THE ATMOSPHERE.

On this subject Mr. Septimus Piesse, in a communication addressed to the *Times*, makes the following remarks.

Justice demands that the good qualities of smoke should now be shown. In an artistic view of it smoke is undoubtedly a great evil, because it blackens our buildings, and casts shadows upon them where there should be light. Nevertheless, smoke is not an unmitigated evil. In a sanitary or chemical point of view it is very beneficial, for it purifies the air when contaminated with the poisons of malaria. Smoke, in truth, is nothing more than minute flakes of carbon or charcoal. Carbon in this state is like so many atoms of sponge, ready to absorb any of the life-destroying gases with which it may come in contact. In all the busy haunts of men, or wherever men congregate together, the surrounding air is, to a certain extent, rendered pernicious by their excretions, from which invisible gaseous matter arises, such as phosphoretted and sulphuretted hydrogen, cyanogen, and ammoniacal compounds, well known by their intolerable odour. Now, the blacks of smoke (that is the carbon) absorb and retain these matters to a wonderful extent. Every hundredweight of smoke probably absorbs 20 cwts. of the poisonous gases emanating from the sewers and from the various works where animal substances are under manipulation—by fellmongers, for instance, fat-melters, bone-crushers, glue-makers, Prussian blue-makers, &c. This accounts for the fact that London, although the most smoky, is yet the healthiest metropolis in the world. In waging war, therefore, against smoke, as an artistic evil, it is not wholly wise to dispense with it, on account of its sanitary value. Before we try to throw *off* the cloud-cap of London, we should shut off the sewers from all upward communication with the streets, and by an Act of Parliament send the bone-crushers to Salisbury Plain. As London is at present constituted, smoke is the very safeguard of the health of the population: it is unquestionably the mechanical purifier of a chemically-deteriorated atmosphere.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

EWBANK, THOMAS HENRY, of South-square, Gray's-inn, Middlesex, gentleman. *Improvements in the manufacture of terry or*

*looped fabrics, and in machinery for producing the same.* Patent dated March 1, 1854. (No. 498.)

This invention consists in raising or forming terries or loops in the weaving or manufacturing of terry fabrics upon or by means of nibs or spurs fixed upon carrier wires.

GOTTUNG, JOHN BAPTISTE, of Hawley-place, Kentish-town, baker. *Embroidering on leather for harness and other purposes.* (A communication.) Patent dated March 1, 1854. (No. 499.)

The patentee employs for this purpose peacocks and other birds' feathers, the stems of which are cut longitudinally into breadths of about the sixteenth of an inch, the pithy, or underneath part of the feather being pared away, but as much length as possible being preserved for the strips. The strips are worked or stitched by means of a needle or other machine, through leather and other similar substances, into various forms and devices.

ROUSSEL, SIMON, of Rue Caumartin, Paris, gentleman. *A new system of painting and colouring glass, being an imitation of old and new church window glasses, called "Typophanic."* Patent dated March 1, 1854. (No. 500.)

The manner in which this invention is performed is as follows:—The glass being well cleaned, the patentee produces upon it stripes, either by cutting the glass with hard bodies or corroding it by means of fluoric acid. He then lays on the glass a preparation of size, and adds to it some saccharine, gummy, or mucilaginous substance, in order to render the colours more adhesive; or he covers the glass with a varnish, mixing therewith a small quantity of salts or chlorides. The designs to be represented are drawn on paper, fibrous stuff, or on a metallic sheet, and the outlines being cut out, they are set on the glass before the size or varnish is dry; these outlines represent the connecting leads of the glass. He also makes use of sheets of paper or other materials, on which the same outlines are cut out, and he afterwards lightly colours the interstices with a pencil. The glass, sized and prepared as above, being dried, he lays on it the colours or varnish, and heats the glass to the temperature of about 140° Fahr., in order to set the colours.

CLIBRAN, WILLIAM and JOSEPH, of Manchester, Lancaster, machinists and copartners. *Certain improvements in apparatus for regulating or governing the supply or pressure of gas as it is conducted from the main to the burners.* Patent dated March 1, 1854. (No. 502.)

The regulation of the supply from the main to the burners is effected by means of *a slide-valve or disc-valve,* formed by two corresponding surfaces placed together between the branch inlet pipe from the main and the branch outlet pipe to the burners—these slide valves having suitable apertures for the passage of the gas, and being so arranged that when the openings or apertures in them are open, the gas will pass freely. The continuous opening and closing of the gas passages in the slide-valve is effected by the variable pressure of the gas acting within a small inverted gas-holder or "gasometer" after the gas has passed the valve, so that as the pressure increases, the gas rising within the gasometer will cause that to be slightly lifted, and by any simple arrangement of connection to the slide or gas-valve, it will be slightly shifted by the pressure of the gas, and consequently open or close the apertures or passages for the flow of the gas, and thus regulate the supply to the burners for combustion.

HOLLAND, JOHN SIMON, of Woolwich, Kent, engineer. *Improvements in locks.* Patent dated March 1, 1854. (No. 505.)

This invention will be fully described in a future number.

METCALFE, THOMAS, of High-street, Camden-town, Middlesex. *Improvements in the manufacture of portable and folding bedsteads, chairs, seats, tables, and cots.* Patent dated March 1, 1854. (No. 506.)

This invention consists in constructing the articles named with four cross legs or supports, the parts of which are formed and put together in such a manner as to admit of their being packed and folded together.

PARRY, JOHN, the younger, of Liverpool, Lancaster. *Improvements in mills or machinery for grinding or cutting bones, wood, or other like substances.* (A communication.) Patent dated March 2, 1854. (No. 507.)

The patentee describes and claims an arrangement of machinery for grinding or reducing bones, wood, or other like substances, the peculiarity of which consists in the use of cutters formed with saw-shaped teeth or cutting edges.

ELLIS, HUGH and JOHN ELLIS, both of Salford, Lancaster, engineers and millwrights. *Improvements in machinery or apparatus for stretching and finishing woven fabrics.* Patent dated March 2, 1854. (No. 509.)

The machinery or apparatus which forms the subject of this patent consists of a cylindrical frame or drum made to revolve on its axis, with set screws to adjust it to any required dimensions, which, as it revolves, takes up the piece goods, stretches and smooths them out, and delivers them to a roller in a finished state. If the goods are wet, they will be dried by the same process, the frame or drum being in this case heated internally.

BARCLAY, ANDREW, of Kilmarnock, Ayr,

engineer. *Improvements in lubricating shafts and revolving metallic surfaces.* Patent dated March 2, 1854. (No. 510.)

Mr. Barclay's improvements consist in so arranging the journal bearings of horizontal shafts that the bearing surfaces may be kept uniformly lubricated, whilst the oil or lubricating fluid is prevented from escaping from the frictional surfaces, and oil once supplied to the bearing remains in good lubricating order until used up by wear.

BARCLAY, ANDREW, of Kilmarnock, Ayr, engineer. *Improvements in arranging and working mining engines and machinery.* Patent dated March 2, 1854. (No. 511.)

This invention consists—1. In the application of the link motion as employed in locomotive and marine engines, for stopping or reversing the movements of the steam valve or valves of mining engines, such link motion being arranged directly on the valve-rod. 2. In a mode of stopping or reversing the valve gearing of mining engines by means of a slowly revolving stop, actuated by the engine itself, and acting upon the reversing lever. 3. In a mode of stopping or reversing the valve gearing of mining engines by means of a weighted tumbler, which is slowly raised or turned over by the engine itself, and on descending acts upon the reversing lever. 4. In the employment in mining engines of a friction-brake, arranged to be acted upon either by hand or by weighted levers, which are arranged to be set free to act by the over winding of the engine or by the ascent of the cages above the proper height; and 5. In a mode of preventing the fall of the cage in coal pit or other shafts when the suspensory rope gives way, by means of a pulley or pulleys acting frictionally on the guide, and arranged so as to force a lever or levers into frictional contact with the guide, so as to arrest the cage.

DAWSON, THOMAS, of King's Arms-yard, London, engineer. *Improvements in umbrellas and parasols.* Patent dated March 2, 1854. (No. 513.)

This invention consists in covering the frames of umbrellas and parasols with a cover of cloth or other suitable material, whether made waterproof or not, the joints of which are formed, united or secured by a solution of caoutchouc, gutta percha, or other like adhesive material, spread upon strips of silk or other suitable material, or upon over-lapping parts at the edges of such joints.

TANN, JOHN, of Minerva-terrace, Hackney-road, Middlesex, patent lock-manufacturer. *Improvements in the construction of locks.* Patent dated March 2, 1854. (No. 514.)

A peculiar feature of this invention is that the stump, or that part of the lock which first takes the pressure from the bolt, is so arranged with respect to the other parts of the lock as to be entirely independent of the bolt, instead of being affixed to it, as heretofore generally practised.

YATES, TIMOTHY, and RUFUS YATES, of Bury, Lancaster, overlookers. *Improvements in looms.* Patent dated March 3, 1854. (No. 516.)

This invention consists of a new construction of loose and fast reed. The patentees employ a vertical rod fastened to the slay sword, and working in a slotted bracket fixed to the frame of the loom. To the underside of the slay they fix a forked finger, which extends to the bottom cap-reed, and is acted upon by the vertical rod during the forward and backward motion of the slay, so that when the weft is beaten up, the forked finger, by the action of the vertical rod, keeps the reed perfectly fast, without having any communication with the shuttle or swell.

TINDALL, LORENZO, of Scarborough, York. *Improvements in churns.* Patent dated March 3, 1854. (No. 518.)

This invention relates to rotatory churns of the ordinary "barrel" kind, and consists in setting the barrel or cream-receiver diagonally as regards its spindle, so that the axis of revolution makes an angle with that of the barrel instead of being coincident with it, as in the ordinary arrangement. The churning action of this arrangement is essentially different from that of the simply rotatory churn, inasmuch as the cream under treatment partakes of a species of duplex or differential movement, which materially accelerates the formation of the butter.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for measuring and folding cloth and other fabrics or manufactured materials.* (A communication.) Patent dated March 3, 1854. (No. 521.)

The improvements consist—1. In making the folding-table of machinery for folding and measuring cloth to move with a reciprocating axial motion, and in making the said motion adjustable, in order to change the length of the folds to be made and measured. 2. In the combination of such a moving folding-table with guiding folders and elongated holders to each side of the table, for folding and guiding the cloth to be folded. 3. In making the said holders adjustable upon the ends of the folding-table, so as to accommodate different lengths of folds. 4. In an arrangement for lifting the holders alternately; and 5. In an arrangement for relieving the cloth, when folded, from the folders and holders, so that it may be removed from the folding-table.

BLOOMER, CALEB, of West Bromwich,

manufacturer. *Improvements in spikes and bolts.* Patent dated March 3, 1854. (No. 522.)

The object of these improvements is to enable the spikes and bolts to retain a more secure hold when driven home; and this is accomplished by slitting the points thereof either with one or more slits, and employing wedges or other suitable-formed blanks, introduced into the spike or bolt holes, for the purpose of thrusting out the points of the spikes or bolts, and fanging them into the timber.

BOUR, JOSEPH, of the Mauritius, but now of Cullum-street, London. *Improvements in evaporating saccharine liquids.* Patent dated March 3, 1854. (No. 523.)

This invention consists of a combination of hollow revolving vessels, suitably constructed for being filled with and heated by steam.

VAUGHAN, WILLIAM, of Stockport, Chester, gentleman, and JOHN SCATTERGOOD, of Heaton Norris, Lancaster, machinist. *Certain improvements in machinery, apparatus, or implements for weaving.* Patent dated March 3, 1854. (No. 524.)

The patentees claim—1. The use of gutta percha as a material for shuttles. 2. The application of an appendage or appendages to the shuttle-boxes of power looms for the purpose of staying the motion of the picker and shuttle. 3. An apparatus for effecting the throw of the shuttle in power-looms by means of spurs or wipers on the crank-shaft or crank-arms. 4. The application of perforated metal plates to the taking-up beams or rollers of looms, for the purpose of causing the adhesion of the woven fabric thereto. 5. The application of similar plates to the rollers or barrels of self-acting temples; and 6. The combination of a break-wheel and break with a friction-coupling or clutch.

NIGHTINGALE, CHARLES, of Wardour-street, Soho, Middlesex, bedding manufacturer. *Improvements in the mode of curling horse-hair and other materials.* Patent dated March 4, 1854. (No. 526.)

This invention consists in combining the two processes of spinning and "buttoning," which, together, constitute that of curling, in such a manner as to admit of the "buttoning" being carried on without stopping the spinning.

The machinery by which this is effected consists of a spindle mounted within a wheel or pulley, to which rotary motion is imparted; the material to be spun being wound round the spindle, and the end carried to a revolving reel or other contrivance, so that as the material is supplied to the spindle at one side of the revolving wheel or pulley, it becomes spun, and is delivered from the spindle in a spun state, and as it is so delivered, becomes further *twisted* or "buttoned" by means of the *separate revolution* imparted to the reel, or other contrivance, on which it is wound, or to which it is attached.

DE BERGUE, CHARLES, of Dowgate-hill, London, engineer. *Improvements in apparatus for bearing and buffing purposes.* Patent dated March 4, 1854. (No. 527.)

This invention consists,—1. In making or constructing the brass or other metal bearing or step of railway and other axle-boxes, so that it shall itself form the upper and principal portion of the axle-box, and that the grease-cup shall by that means be formed in and become part of the actual brass or bearing; and that it may also be made to form in itself the requisite projections at the back and front of the box, which serve, in connection with the other parts, to inclose the journal and to protect it from wind and dust. 2. In connecting or securing two or more of such axle-boxes together in a direction at right angles to the axles to which they are to be applied, by means of bars, plates, rods, or other means, so as to maintain them in their proper positions. 3. In the adaptation to the spindles, rods, guides, or framing of India-rubber springs, or helical, or spiral, or disc metal springs, of India rubber, leather, or other suitable material, for the purpose of allowing a certain amount of play, and of lessening noise and vibration. 4. In making the principal pieces or parts of the cases or framing of that description of buffers or buffing apparatus for carriages in which vulcanized India-rubber or metal springs are employed to afford the requisite elasticity, and are inclosed in telescopic or sliding cases or framing, in such manner that the one may not only slide within the other, but that they may also be properly held together by the form of the pieces or parts themselves, instead of depending upon a central rod or bolt for the purpose.

MADELEY, RICHARD, of Birmingham, Warwick, merchant and manufacturer. *An improvement or improvements in the joints and framing of metallic and other bedsteads, chairs, sofas, couches, and such other articles as are, or may be used for sitting, lying, and reclining upon.* Patent dated March 4, 1854. (No. 528.)

This invention consists in constructing the joints and framing of the articles named in the title, by forming wedge-shaped pieces on the ends of the framing, which, when the framing is put together, engage in wedge-shaped cavities in the corner blocks, so as to expand the framing and tighten the laths or sacking.

ABATE, FELIX, of George-street, Hampstead-road, architect and civil engineer. *Improvements in printing on and ornamenting surfaces.* Patent dated March 4, 1854. (No. 529.)

The object of this invention is to make

ons or representations of natural tificial objects, by printing with the themselves upon any suitable sub- When the object to print with is orous and absorbent nature, and the on which the print is to be made is sed of wood, calico, paper, &c., the e either wets the printing object with ion of an acid or acid salt, then prints is object, and exposes the impression action of strong heat; or he wets the g object with a mordant or discharge, ints with this object, and finishes the by dyeing in the usual way. When rface is a metallic one, he wets the to be printed from with a solution of of copper or antimony, or with a ig fluid, and then takes the impres- hich he finishes with coloured varnish. duce imitations of figured fabrics, tentee takes a piece of tin foil, and on the figured fabric, placing both n two sheets of India rubber. He ibmits the whole to pressure, which the figuring of the fabric to be sed upon the tin foil; and this figur- ien coloured, forms the imitation.

TENS, HERMAN DIRS, of Margate, gentleman. *Improvements in working ngine valves.* Patent dated March 4, (No. 530.)

patentee describes an arrangement ch an eccentric on the crank axis motion by a connecting-rod to a slotted lever, and to a link which is ted at one end to the reversing lever, the other to the connecting-rod. lve-rod is connected by a link or con- -rod to a lever, which moves on an arried by an arm on the axis of the lever, while the other end of the connection with the slide-rod is in tion with the piston-rod.

R, DAVID, clerk, of Sadbrook Park, ond, Surrey. *An improved combined ush and comb.* Patent dated March 6, (No. 533.)

invention consists in combining a ush and comb, by attaching the hair- nd comb to a chamber or receptacle ing oil or other matter with which is to be dressed, which oil or other may be forced from the chamber or le on to the comb or brush during of the same.

HURST, JOHN, of Hollingworth, , cotton dealer. *Improvements in ilers.* Patent dated March 6, 1854. 4.)

invention consists in constructing oilers in such manner as to admit steam first produced being confined ducted through tubes or pipes fixed he same boiler or vessel, or from one boiler or vessel to another boiler or vessel containing tubes or pipes, which tubes or pipes pass through or are surrounded by the water or other liquid from which steam is to be produced, thus giving an extensive heated surface to the water.

GALLOWAY, JAMES, of Bolton-le-Moors, Lancaster, brassfounder. *Improvements in the construction of cocks, taps, and valves.* Patent dated March 6, 1854. (No. 535.)

Mr. Galloway describes and claims an improved mode of constructing cocks, taps, and valves, with an elastic or flexible diaphragm, whereby the elastic or flexible diaphragm is pressed on to the orifices, through which the liquid flows, and is raised or lifted off them without being connected or attached to the spindle or button by which the diaphragm is depressed.

NIVELLES, THIERRY HUBERT DE, of Foley-place, Middlesex, gentleman. *Certain apparatus for separating metallic from earthy and other substances, and for classifying metallic substances according to their specific gravities.* Patent dated March 6, 1854. (No. 538.)

This apparatus consists of a combination of washing and subsiding vessels, so arranged and worked as to effect the separation and classification of metals when mixed with earthy and other like substances.

SICARD, PIERRE AMABLE DE ST. SIMON, of Paris, chemist. *Improvements in purifying sea and other water.* Patent dated March 6, 1854. (No. 540.)

This invention consists in causing the water to be purified to enter the evaporating vessel by percolation through a porous material, and to be evaporated in vacuo from the surface of such porous material at such a temperature that the animal and vegetable contents of the water may not be charred.

CLAY, WILLIAM, of Liverpool, Lancaster, iron master. *An improved mode of manufacturing axles, shafting, and other like solid articles which present a round figure in cross section.* Patent dated March 7, 1854. (No. 544.)

The patentee claims the use and application for the aforesaid purpose of a roller or cylinder, made to rotate within a concave case, the working surfaces of such roller or cylinder and concave case, or either of them, being indented, or so formed as to produce the necessary form of axle or shaft; and also the use of a moveable plate or plates, in combination with a stationary bed for the same purpose, the surfaces of such plate and bed, or one of them, being indented or so formed as to produce the required form of article.

DUNN, THOMAS, of the Windsor-bridge Iron Works, Pendleton, Lancaster, engineer. *Improvements in machinery and ap-*

*paratus for moving engines and carriages from one line of rails to another, and turning them.* Patent dated March 8, 1854. (No. 547.)

This invention consists,—1. In constructing the bodies or upper framing of railway traversers and turn-tables of a convex form, in order to increase the strength, and afford space for larger bearing wheels. 2. In supporting turn-tables on side rollers working on an inner circular rail or plate. 3. In the application of several small rollers, and a live ring in place of the side rollers above referred to. 4. In improved modes of constructing beams for railway turn-tables. 5. In making the centre piece of the platform of a railway turn-table with an inclined surface or surfaces in such wise, that when pressure is applied thereto, the platform is partially raised, and caused to swivel on its centre. 6. In the application to railway traversers of a centre pin, so as to render the same capable of acting as a turn-table. 7. In causing the axes of the wheels of railway traversers to radiate from a centre when used as turn-tables. 8. In so constructing turn-tables that the level of the rollers or wheels, on which the platform revolves, can be regulated from the outside thereof; and, 9. In regulating the centre pin of turn-tables by a wedge and screw, instead of by screws only, as heretofore.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SIBLEY, JOHN, and THOMAS SIBLEY, both of Ashton-under-Lyne, Lancaster, machine-makers. *Improvements in machinery or apparatus for cutting discs or circles out of plates or sheets of metal or other substances.* Application dated March 1, 1854. (No. 501.)

This invention consists of a combination of the machine known as the circular shearing-machine, with an apparatus by which the sheet or plate of metal to be cut into a circle is kept central, and at a distance from the circular shears equal to the radius of the discs or circles required, and which at the same time affords the means of readily entering the sheet or plate between the shears, and of adjusting it to the best cutting angle for all diameters.

ILLAKOWICZ, MICHEL NAPOLEON, artist, of Maddox-street, London. *Improvements in picture-frames.* Application dated March 1, 1854. (No. 503.)

The improvements consist in rendering the same picture-frame susceptible of being enlarged or diminished, in any given proportion, without deranging the position of the ornaments.

HOUSSART, RICHARD VINKELES, of Dunstan-street, Kingsland-road, Middlesex, and ROBERT HOUSTON, of Skinner-street, Snow-hill. *Improvements in vessels to contain fluids.* Application dated March 2, 1854. (No. 508.)

This invention consists in fixing and hermetically closing a bag of waterproof flexible or elastic material around the inner circumference (but loose from the vessel, except at the point of junction) of a cask or vessel about midway between the two ends, in such a manner that when it is filled, the bag shall distend, and form, to a certain extent, an interior vessel, or lining to the upper portion.

CURRIE, JOHN, of Glasgow, Lanark, miller. *Improvements in the treatment and grinding of grain and the products thereof.* Application dated March 2, 1854. (No. 512.)

These improvements relate to the washing and cleansing of Egyptian wheat and other grain, by passing it from a screen or riddle into one end of a long narrow water-trough, having a perforated false bottom of semicircular section, above which is a horizontal shaft, with a series of inclined blades or arms upon it, such arms being fitted to work just clear of the false bottom, and at a considerable depth beneath the water surface. The shaft carrying the blades is caused to revolve so that they agitate the grain in the water, and convey it to the delivery end of the trough, whence it is lifted out by a dipping-chain or perforated buckets.

BOYLE, JOHN AUGUSTIN, of Alfred-place, Bedford-square, London. *Crushing or reducing to powder, pulp, or wash, any matter.* Application dated March 3, 1854. (No. 517.)

The inventor employs a machine consisting of a basin of perfect concavity, in which works a corrugated or serrated conical weight, placed perpendicularly, and giving motion to one or more conical weights or mill-crushers, which pulverize, wash, mix, or amalgamate any substances which may be placed in the basin.

SPILL, GEORGE, of Old Farm-house, Stepney. *Improvements in the application of waterproof hat-bands to the manufacture of hats.* Application dated March 3, 1854. (No. 520.)

This invention consists in constructing a hat (which the inventor calls the Adiantum Hat) to which a hatband, rendered waterproof by any suitable waterproofing composition, is immovably united by the said waterproofing composition, or by some other adhesive composition.

ROWLAND, ELLIS, of Manchester, Lancaster, engineer. *Certain improvements in machinery or apparatus for manufacturing bricks or tiles from clay or other plastic materials.* Application dated March 4, 1854. (No. 525.)

The apparatus consists of a feeding-hopper for the clay, &c., which is introduced into the moulds or recesses in a circular table, and as such table of moulds revolves, the brick or mass of material in the mould arrives over a pallet or plunger, which is caused to ascend with considerable and instantaneous pressure, thereby compressing the material in the mould into a solid brick or block.

WENHAM, FRANCIS HERBERT, of Effra Vale-lodge, Brixton, Surrey. *An improved hydraulic machine for registering or indicating the flow or quantity of fluids and obtaining power.* Application dated March 4, 1854. (No. 531.)

The inventor describes his machine to consist of a cylinder, disc, or drum, having attached to it vanes or blades, either at right angles or parallel to its axis, which cylinder, disc or drum, rises and falls vertically with the ascending columns of water, and is supported and rotates therein, the rotation being caused either by the current acting on the inclined vanes by the reaction of its flow through tangential or other formed interstices, in the casing of the machine; the compensation for speed being also performed by the rise and fall of the cylinder, disc or drum, opening or closing the entrance of the water-way more or less in proportion to its current.

STUART, JOHN KNOX, of Glasgow, Lanark, surgeon. *Improvements in hats and other coverings for the head.* Application dated March 4, 1854. (No. 532.)

Mr. Stuart proposes to apply along the interior of the hat body a series of tubes of horse-hair, India-rubber, or other elastic material, disposed so as to run in lines parallel with the axis of the hat, or to use elasticated materials, arranged in plaits or folds, or in other ways which will afford the necessary elastic action, and enable the hat to adapt itself easily to the conformation of the head.

BARCLAY, ANDREW, of Kilmarnock, Ayr, engineer. *Improvements in condensing engines.* Application dated March 6, 1854. (No. 536.)

According to these improvements the exhaust is made slightly before the arrival of the working piston at the bottom of its stroke; the exhaust steam then being above atmospheric pressure blows directly through the condenser (which is preferred to be in the form of a long narrow tube, fitted with a clack or other valve opening outwards, the valvular end being immersed in a water cistern), and this rush of steam carries before it the air in the condenser and passages, and discharges the same through the terminal valve. The cold water injection is then let on, and the contained steam is fully condensed: after which the condensing water is shut off, and the succeeding rush of steam again drives out before it the contained air. This process being repeated at each stroke, the engine has an effective working vacuum independent of any air-pump.

CHAPIN, SAMUEL AUSTIN, of Trafalgar-square, Westminster, Middlesex. *An improved mode of purifying smoke produced by the combustion of coal or other substances, and for condensing and collecting the solid and other matter contained in the smoke and vapour arising from the combustion, smelting, burning, or wasting of fuel and other substances.* (A communication.) Application dated March 6, 1854. (No. 537.)

This invention consists in the purification of smoke and vapour, by means of water, so distributed that the solid matter and impurities shall be condensed and carried off by the water before the smoke or vapour escapes from the chimney or flue.

RONALD, JOHN, of Patrick Bank, near Paisley, printer and manufacturer. *Improvements in printing yarns and threads.* Application dated March 6, 1854. (No. 539.)

The inventor proposes to impress the colour upon the yarn or thread by means of a series of parallel rollers brought into contact with the yarn or thread as wound upon a drum, the rollers extending from end to end of the drum, and each roller being partially immersed in colour contained in a colour trough.

MORTON, JOHN RICHARD, of Oxford-street, Middlesex. *Improvements in shades and reflectors applicable to certain descriptions of lamps, lanterns, or chandeliers.* Application dated March 6, 1854. (No. 541.)

This invention consists in the application of a metallic reflective covering or coating to various parts of the glass shades of lamps, lanterns, or chandeliers, whereby the employment of the ordinary detached reflectors may be wholly or partly dispensed with.

BROKENSHAR, BENJAMIN, of St. Austell, Cornwall, mining engineer. *An improved amalgamator.* Application dated March 6, 1854. (No. 542.)

The amalgamating chamber is a vessel wherein are vertical teeth set in a frame, or in arms, which receive motion from a suitable shaft or spindle, so as to agitate the contents of the said chamber. The supply of ore to the chamber is regulated by the action of a float contained therein on a valve which controls the delivery of the ore.

JOHNSON, JEREMIAH, of Church-street, Leatherhead, Surrey. *A new stop for railway and other carriages.* Application dated March 7, 1854. (No. 543.)

The inventor proposes to employ substantial iron hooks, hinged to the bottom of the carriages, which can be lowered so as to come into gear with ratchet-teeth formed on strong wheels, fixed between the lines of rails.

RIXON, FREDERICK, of Cockspur-street, Westminster, glass-manufacturer. *Improved apparatus for lowering and disengaging ships' boats.* Application dated March 7, 1854. (No. 546.)

The inventor causes the davits to work on a hinge-joint, and he connects their extremities together by a cross-bar, thus forming a kind of swing-frame, from which the boat is suspended.

## PROVISIONAL PROTECTIONS.

### *Dated June* 9, 1854.

1279. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in stitching and sewing-machines, and in machines for securing and ornamenting parts of garments and other materials.

### *Dated August* 16, 1854.

1782. William Charlton Forster, of Hatton-garden, Middlesex. The manufacture of gas for illumination and heating from materials not hitherto employed for such purpose.

### *Dated August* 21, 1854.

1832. Robert Brisco, of Low Mill House, Saint Bees, Cumberland, Esq., and Peter Swires Horsman, of St. John's, Beckermet, in the same county, gentleman. Improved machinery for preparing flax, hemp, and other fibrous substances for spinning.

### *Dated September* 4, 1854.

1926. John Fish, of Livesey, near Blackburn, Lancaster, and John Thompson, of Witton, near Blackburn aforesaid. Improvements in the mode or method of picking warps.

1928. George Mackay Miller, of Inchicore, Dublin, civil engineer. Improvements in axle-boxes and parts working in connection with axles of carriages and other vehicles in use upon railways.

1930. William Hill, of Congleton, Chester, hatter. Certain improvements in doubling or twisting net or raw silks.

1932. William Haslett Mitchel, of Brooklyn, New York, United States of America. Improvements in means for distributing type.

1934. Francis Alfred Skidmore, of Coventry, and Joseph Bolton, of the same place, metal workers. Improvements in the manufacture of cast-iron pipes.

### *Dated September* 5, 1854.

1937. William Brownfoot, of Leeds, York, cabinet-maker and upholsterer. A new or improved instrument or apparatus for raising, lowering, and adjusting Venetian blinds.

1938. François Xavier Alexis Fauvelle, merchant, of Paris, France. Certain improvements in cleaning dressing-combs. A communication.

1939. Henry Trappes, of Manchester, Lancaster, gentleman. A process for the preparation of leather to be used in the manufacture of a new flock, and for the manufacture of the same, to be used and applied in lieu of flock made from pounded or ground wool and woollen materials, heretofore commonly used in the manufacture of painted, printed, and dyed decorating papers, carpets, oilcloths, and other things, and also to be used as a paste or pulp for the manufacture of all kinds of paper, parchment, and pasteboard, of toys, of ornamental, and other picture-frames, of mouldings, architectural and sculptural ornaments, and other things. A communication.

1940. Samuel Stocker, of Brighton, Sussex, engineer. Certain coverings for various parts of the human body, with a view to the preservation of health.

1941. William Barnes, of Royal Exchange-buildings, London. Improvements in fastening rails of railways.

1942. John Henry Pape, of Paris, Rue des Bons Enfants. Improvements in wind musical instruments.

1943. Isaac Pim Trimble, of New York, United States of America, doctor of medicine. Improvements in regulating the temperature in conservatories and other apartments, or in ventilating the same.

1944. John Henry Pape, of Paris, Rue des Bons Enfants. Improvements in pianofortes.

### *Dated September* 6, 1854.

1948. William Newbould, of Derby, draper. Improvements in the manufacture of busks for stays.

### *Dated September* 7, 1854.

1950. George Printy Wheeler, paper maker, of Bellevue-place, Cleveland-street, Mile-end-road, and Samuel Bromhead, gentleman, of Holford-square, Pentonville. The production of new fibrous materials capable of and suited for the manufacturing of string, rope, matting, and various fabrics, with or without the combination of cotton, wool, or flax, or for pulp for the manufacturing of paper, papier-maché, millboard, &c.

1952. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in coating iron and steel wire with other metals or alloys. A communication from Alexandre Désiré Eugene Boucher and Adrien Muller.

1954. Robert Adams, of King William-street, London. Improvements in breech-loading firearms. A communication.

### *Dated September* 8, 1854.

1956. James Burns, of Manchester, Lancashire. Improvements in ventilating ships.

1958. John Jones, of Sheffield, York, manufacturer. Improvements in metal dinner and dessert forks.

1962. Robert Macallister, of Glasgow, Lanark, pattern-maker. An improvement in fitting or applying screw propellers to ships and vessels.

1964. Edwin Travis, of Oldham, Lancaster, cotton-spinner. Improvements in apparatus for measuring water and other fluids.

1966. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots and shoes or other coverings for the feet.

1968. Benjamin Hustwayte, of Hockley-street, Homerton, Middlesex, bricklayer. An improved construction of metal roofing.

### *Dated September* 9, 1854.

1970. Achille Guyardin, of Paris, France. The use of a certain fibrous matter for the manufacture of paper and pasteboard.

1972. William Bowler, of Southwark-bridge-road, Surrey, hat-manufacturer. Improvements in hats and other coverings for the head.

1974. Thomas Clowes, of Beverley, York, saddler. Improvements in muzzles for horses, or apparatus to prevent horses from biting or sucking their cribs or mangers.

### *Dated September* 11, 1854.

1976. John Rigby, of Dublin, gun-maker. Improvements in fire-arms and guns, and in waddings to be used therewith.

1978. John Norton, of Cork, Ireland, Esq. Improvements in the manufacture of ropes, bands, and cordage.

1980. Samuel Szontagh, of Paris, France. Improvements in sewing-machines.

*Dated September* 12, 1854.

1982. Martin Billing, of Birmingham, Warwick, manufacturer Improvements in manufacturing and ornamenting castors for furniture.

1984. Edmund Morewood and George Rogers, of Enfield. Improvements in baths or receptacles for melting and containing certain metals for the purpose of coating other metals.

*Dated September* 13, 1854.

1988. William Nash, of Islington, builder, and John Jewell, of the same place, Middlesex, cabinet-maker. Improvements in window-sashes and frames.

1990. Auguste Edouard Loradoux Bellford, of Castle-street, London, patent-agent. Improvements in electro-magnetic clocks. A communication.

1992. Anguish Honour Augustus Durant, Esq., of Tong Castle, Salop. A new or improved axle and axle-box, to be called the anatreros or anti-friction axle, which said axle and axle-box may be used for wheel-carriages and for a shaft or axle, and bearings for machinery in general.

1994. Henry Crosley, of Camberwell-grove, Surrey Improvements in the manufacture of paper, millboard, and felt from materials not hitherto so used.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," September 26th,* 1854.)

1077. Henry Heathcote Russell. An improved and ready mode of coupling, connecting, or joining.

1080. Anguish Honour Augustus Durant. Improvements in apparatus for sweeping chimneys and flues, and for extinguishing fires therein.

1086. Henry Cornforth. An improvement or improvements in shaping and ornamenting metals.

1088. Alfred Vincent Newton An improved construction of tenon and of machinery for forming the same, applicable to the manufacture of boxes and other analogous uses. A communication.

1098. Christopher Catlow and Thomas Cemative. Improvements in shuttles for weaving.

1100. Squire Diggle. Improvements in looms for weaving

1121. Thomas Murray Gladstone An improved traverser or machine for shifting railway carriages from one set of rails to another

1130. John Crossley and William Crossley. Improvements in Jacquard machines.

1133. Berkeley William Fase An improved construction of brooch for fastening dresses.

1134 William England Improvements in pneumatic and hydraulic wheels and fans.

1137. Frederick Clark. An improvement in fixing the spindles of door and other knobs and handles.

1140. Joseph Kuczynski. Improvements in preparing baryta and its salts.

1170. Julius Schmeock. Improvements in the construction of children's and other carriages moved by manual power.

1191 Joseph Riddsdale Improved means or methods of communicating between different parts of ships and other vessels.

1233. Peter Armand Lecomte de Fontainemoreau. Improvements in the construction of umbrellas and parasols. A communication.

1246. Hippolyte Dordier. Improvements in the manufacture of alcohol. A communication.

1327 Louis Ambroise Henry. Certain improvements in constructing railroads.

1393. Robert Michael Letchford. A match-stand and holder for holding matches while being ignited.

1404 Alexander Bain. Improvements in fire-arms and the apparatus connected therewith.

1436. Nathan Thompson. Improvements in regulating the supply of steam from steam boilers.

1500 John Sudbury and Samuel Wright. Improvements in taps and valves, and in the method of working them for the purpose of regulating the passage of fluids

1583. Henry Green. Improved apparatus applicable to the hanging of doors, gates, and windows, and for closing or holding open the same when required.

1696. Thomas Edward Merritt. Improvements in apparatus for taking photographic pictures in the open air

1703. Paul Garavaglia de Soresina. Improvements in treating flax and hemp.

1730. Henry Moorhouse. Improvements in certain parts of machinery or apparatus used in preparing cotton, wool, or other fibrous materials to be spun.

1819. William Johnson. Improvements in moulding or shaping articles of vulcanized caoutchouc. A communication.

1830 William Johnson. Improvements in the manufacture of hat-bodies. A communication.

1832. Robert Brisco, and Peter Swires Horsman. Improved machinery for preparing flax, hemp, and other fibrous substances for spinning.

1870. George Wall. Improvements in machinery or apparatus for the manufacture of pottery

1888. John Gray. A self-acting flushing apparatus, which may be arranged for registering the quantity of water or other liquid flowing through it.

1896. William Campion. Improvements in the manufacture of warp fabrics.

1924. Alfred Vincent Newton. Improvements in machinery applicable to the cutting, dressing, and polishing of stone. A communication.

1928. George Mackay Miller Improvements in axle-boxes and parts working in connection with axles of carriages and other vehicles in use upon railways.

1929. John Lockhart White and Henry Henderson. Improvements in water-closets.

1972. William Bowler Improvements in hats, and other coverings for the head.

1978. John Norton. Improvements in the manufacture of ropes, bands, and cordage.

1980. Samuel Szontagh. Improvements in sewing-machines.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed September* 22, 1854.

686. Lawrence Whitaker and Doctor Ashworth.
704. George Beaumont.
708. Frederick Phillips.
757. Thomas Scott.
760. William Ashdown.

788. John Weston.
793. Simon O'Regan.
814. John Rankin.
815. Henry Bollmann Condy.
840. Felix Lieven Bauwens.
855. William Henry James.
888. Samuel James Healey.
908. Robert Richardson.
975. James Fenton.
1166. Edouard Cari Mantrand.
1189. William Northen.
1212. David Duncan.
1359. Oliver Rice Chase.
1446. George Hutchison.
1510. Stephen Martin Saxby.
1564. Joseph Spires.
1636. John M'Gaffin.
1644. Edmund Alfred Pontifex and Chas. Glassford.
1688. Thomas Ridgway Bridson.

*Sealed September* 26, 1854.

714. Alfred Hodgkinson.
716. Henry Francis.
733. Philip John Passavant and John Cure.
768. Joseph Bentley.
789. James Smith.
857. Edward Briggs.
893. Charles Watt.
898. Jean Daniel Pfeiffer.
916. Frederick Buonaparte Anderson.
925. Pierre Jean Felix Mouchel.
933. David Buddo.
986. Robert James Maryon.
1011. Vincent Wanostrocht.
1067. Auguste Edouard L. Bellford.
1125. Auguste Edouard L. Bellford.
1427. William John Bisseker.
1514. Edwin Wolverson.
1545. Alexander Southwood Stocker.
1598. Thomas Chambers, jun.
1624. George Fergusson Wilson and George Payne.
1633. Thomas Bell and Henry Scholefield.
1635. Julius C. Hurd.
1642. Auguste Edouard L. Bellford.
1650. Auguste Edouard L. Bellford.
1669. James Gilbertson.
1681. Henry Walduck.
1693. John M'Gaffin.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*Subscriber*, Belfast.—We regret that we cannot furnish you with the required information.

*Birkenhead*.—Your invention, if it can be successfully carried out in practice, will be of very high value. We should certainly recommend you to bring it forward without loss of time.

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. *Dublin*; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1626.] SATURDAY, OCTOBER 7, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## DALGETY'S ROTARY STEAM ENGINE.

Fig. 1.

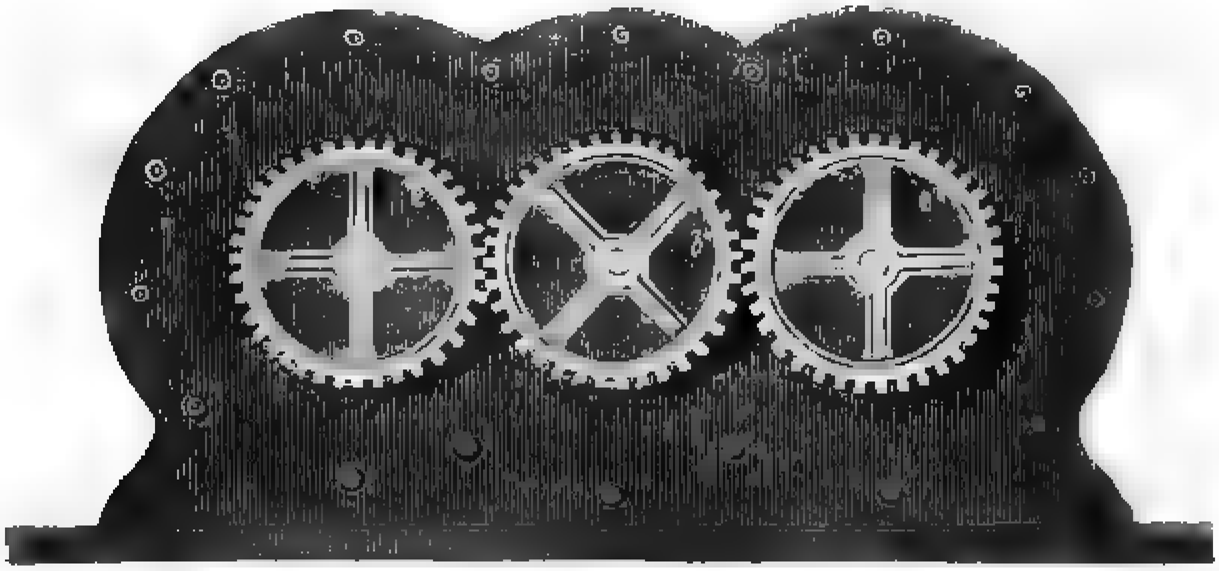


Fig. 2.

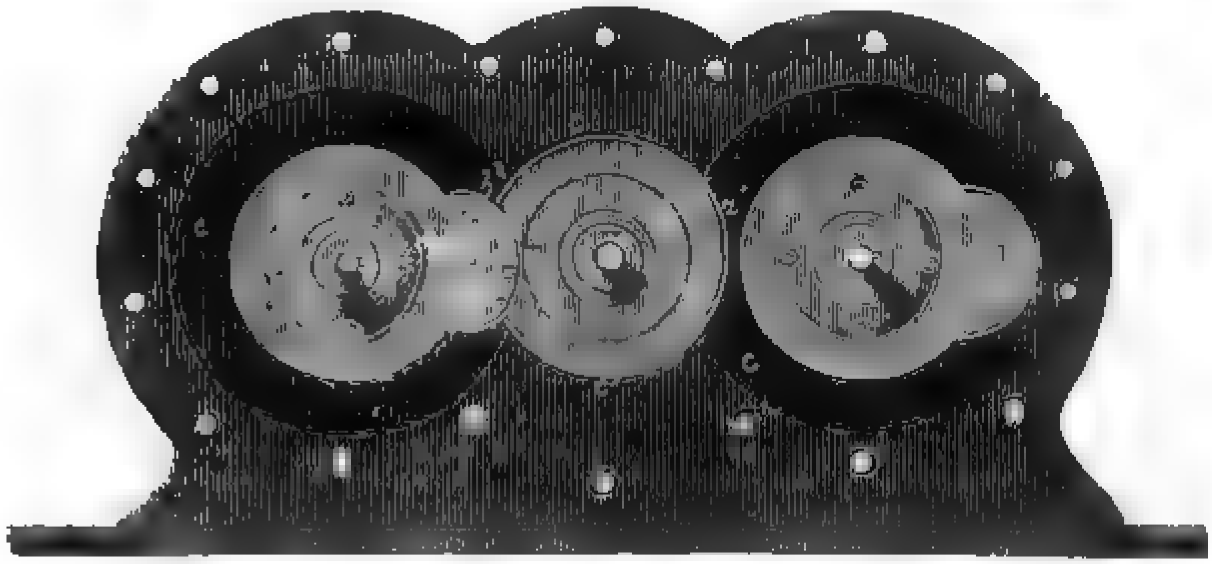
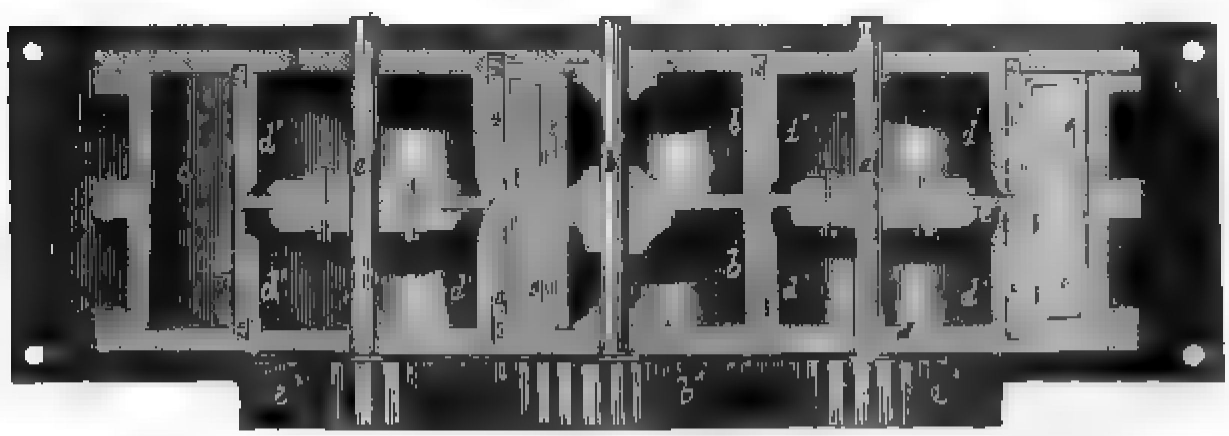


Fig. 3.



## DALGETY'S ROTARY STEAM ENGINE.

(Patent dated August 15, 1853.)

Mr. Dalgety, of Deptford, has patented an invention which "consists," says his specification, "in the arrangement and application of two sliding drums or cylinders, *a a*, and of one revolving drum or cylinder, *b*, each of equal diameter, carried by axes, as hereafter described, by which arrangement great speed may be acquired without liability of derangement of the parts, and by which arrangement the destructive pressure on the piston-shaft, so injurious to the durability and power of the apparatus (and to which defect steam engines of this class have hitherto been subject) is almost entirely removed. There being but one dead point, and that of very short duration, in every revolution of the piston, the economical principle of working expansively may be carried to a very great extent.

"The outer casing or cylinder consists of two chambers, *c c*, of equal bore or diameter, and a small one, $c^1$, the smaller being rather more than half the diameter of the larger. On the inner side of each cylinder-cover, *d*, and central to the larger chamber, *c*, is cast a hollow circular projection, $d^1$, on which the two sliding drums, *a a*, move, to compensate for wear, the inner edges, $a^2$, of which drums when in their places nearly meet, and between the outer periphery of the drum, *a*, and the inner periphery of the chamber, *c*, a distinct chamber is formed wherein the piston, *e* (which is connected with its shaft, $e^1$, by a thin circular plate, $e^2$, always running steam-tight between the edges of the two sliding drums, *a a*, which press lightly upon it by means of spiral springs, $a^1$, acting upon them) moves. On one side of each sliding drum, *a a*, a wide channel is cut, as shown at $a^*$, and fitted with a metallic packing, having its outer or exposed side concave to fit the convex surface of the revolving drum, *b*, which fits and moves within the smaller chamber, $c^1$. The piston-shafts, $e^1$, and drum-shaft, $b^1$, are connected by spur-wheels, $e^*$ $b^*$, of the same size, which cause the drum, *b*, to present its cavity, $b^2$, in the revolving drum or fulcrum, *b*, at the right moment for the piston to pass through. If the steam be now admitted on either side of the drum fulcrum, *b*, the face of the piston (with the exception of the thin plate before spoken of) will be the only surface capable of receding, and the force of the steam being concentrated on that one point, must obviously become much more effective. *f f* show the induction and eduction passages."

## PROCEEDINGS OF THE BRITISH ASSOCIATION.

We resume our notice of the proceedings of the British Association with the following abstracts of papers, for the two first of which we are indebted to the *Athenæum*:

"ON SOME PECULIARITIES OF THE MAGNETIC FIELD.

"Professor Tyndall accompanied the reading of this paper with experiments adopted for the purpose of better elucidating the subject. He said, a piece of soft iron suspended between the flat poles of an electro-magnet set its largest dimension from pole, the residual magnetism of the cores being sufficient to produce the effect. This is the normal deportment of magnetic bodies, but it is by no means universal. By mechanical agency, by pressure for example, the structure of a magnetic body can be so modified that its shortest horizontal dimension sets from pole. Professor Tyndall exhibited actions of the kind where the body operated on was compressed magnetic dust. In such a body two opposing tendencies were at work,—the tendency due to length, which sought to set the length axial, and the tendency due to structure, which sought to set the line perpendicular to the length axial. Between the flat poles the latter tendency was predominant, but between pointed poles this was not the case; here the attraction of the ends of the magnetic mass constituted a mechanical couple of sufficient strength to overcome the directive tendency which was due to structure, and to draw the mass into the axial line. But in raising or lowering the body operated on out of the sphere of this local attraction, by bringing it into a position where the distribution of the magnetic field resembled that existing between the flat poles, the body forsook the axial position and turned into the equatorial. The complementary phenomena were exhibited by bismuth. A normal bar of this substance sets its length at right angles to the line from the poles; but Professor Tyndall exhibited a bar of this substance, which set between the flat poles exactly as a magnetic body. Such a bar, however, between the points set equatorial. On raising it or lowering it, however, it forsook the equatorial position and set axial. In this case the local repulsion of the ends between the points caused the bar to set equatorial, the influence of length thus predominating over the influence of structure; but removed from the sphere of this local action, the directive

ıcy of the mass triumphed and caused ır to set axial. The bar in this case ıt with its length at right angles to the ı of most eminent cleavage of the bis- It is a proved fact, that these planes, the influence of form is annulled, s set at right angles to the line pierc- ıe poles, and hence where they are erse to the length, the bar will set These phenomena were examined in ıt number of cases; bars were taken ıubstances possessing a directive ten- , and it was so arranged that the di- e tendency due to structure was always ed to the influence of length; between ıints the former tendency succumbed latter, while between the flat poles, or and below the points, the former was phant. It is amusing to observe the of these two tendencies in substances ısing a strong directive action. A of crystallized carbonate of iron, when rly suspended, will wrench itself spas- ally from one position into the other, ind rest nowhere. The simple law governs all these actions is, that if ıdy, cut as above, be diamagnetic, its ı sets equatorial between the points, bove and below them axial. If the be magnetic it sets axial between the ı above and below equatorial. Hence tation of a magnetic body, on being ed from between the points, is always axial to equatorial; while the corre- ing rotation of a diamagnetic body is s from the equatorial to the axial. The tment of wood in the magnetic field ext described. Nearly sixty specimens ned by Professor Tyndall were all dia- etic; each of them was repelled by the of the magnet; cubes of each when ıded with the fibre horizontal set be- the excited poles, the fibre perpendi- to the line which unites the poles. ting that wood, on account of its struc- would exhibit those directive pheno- which had been demonstrated in the of the bodies mentioned at the com- ement, bars were taken from nearly kinds of wood, the fibre being at right s to the length of the bar; in the centre space, between two flat poles, all those set their lengths from pole to pole. Professor Tyndall afterwards observed markable fact, that homogeneous dia- etic bodies did the same. Bars of sul- of salt of hartshorn, of wax, and other ıgnetic substances, when suspended in entre of the space between two flat set their lengths from pole to pole. as diamagnetic bodies always take up osition of weakest force, it was proved ese experiments, and corroborated by s not cited here, that the true force of the centres of two flat poles, contrary to the general opinion hitherto received, was the line of minimum force.

"The Rev. Dr. Scoresby stated that, by subjecting to force ordinary magnets of hardened steel, as by suddenly bending them, or striking them in particular modes, they may have their poles reversed or be deprived of their magnetism, or hardened non-magnetic steel may be instantly rendered magnetic; and he considered that these facts, which he had long since made public, should be kept before the mind in such investigations as the very original and interesting facts just brought under the notice of the Section.—Professor Faraday, after very briefly, yet lucidly, explaining to the Section the leading distinctions between paramagnetic and diamagnetic bodies, and their behaviour in the magnetic field, said, that it was conceded on all hands that the explanation was erroneous which Plücker had given of the phenomena which he first discovered connected with the branch of research to which Professor Tyndall had just been directing their attention, and which he was so ably hunting down. But when he said the original explanation of Plücker was erroneous, he did not mean that as the slightest disparagement to that philosopher. It was well understood by all who had any pretensions to scientific knowledge since the days of Bacon, that it was through the mist of error that the most important discoveries had to be made, and that in pursuing any research it was much better in the first stages of the inquiry to have erroneous views, than to be without any views that would tend to connect the scattered facts. For his part, he was not ashamed to own that he was a learner, and that in almost every instance it was through the clouds of error that he arrived at the conclusions which satisfied him most. And as his mathematical skill and acquirements were by no means such as to entitle him to despise instruction, he should feel particularly grateful to his mathematical friends present, Dr. Whewell and others, if they would explain to him and to the Section the law of distribution of the magnetic force in the magnetic field, if it was known.—Dr. Whewell explained how the force would be distributed upon the old theory of magnetic lines; but he said he was aware, and he believed it was now generally admitted, that this theory must be greatly modified, if not given entirely up. But as he saw Professor W. Thomson in the Section, who had paid particular attention to the development of the mathematical theory of magnetical and electrical forces, he trusted that that gentleman would favour the Section with his views.—In answer to Professor Faraday's question, as to the

mathematical conditions under which a uniform field of magnetic force may be produced, Professor W. Thomson remarked, that the mathematical theory of the distribution of force both afforded a remarkably simple and definite general answer, and pointed out the most convenient practical means of fulfilling these conditions, either approximately or rigorously. For, in the first place, it is strictly demonstrable that if the force be rigorously uniform in some locality, in the neighbourhood of any kind of magnet or electro-magnet, through even one one-thousandth of a cubic inch, in fact, through any finite bulk, however small, it cannot but be vigorously uniform through every portion of space to which it is possible to go from that locality without passing through the substance of the magnet. Hence, although between flat poles, such as Mr. Faraday first introduced for obtaining uniformity of force, we have in reality a most excellent practical approximation to a uniform distribution of very intense magnetic force, through a space of several cubic inches, in a locality not only visible, but in every way convenient for experimental purposes; yet it is absolutely impossible that the force can be rigorously uniform through the smallest finite bulk of the magnetic field in any such arrangement, or, generally, in any locality external to a magnet. If an experimenter wants a rigorously uniform field of force, he can only have it in the interior of his magnet; and he must be contented not to see the action he experiments on at the time it is being produced, unless he will follow the example of Professor Faraday, who 'went into a hollow cubical conductor of electricity, and lived in it,' and so was enabled to observe some most interesting and important fundamental properties of electrical force. It would be easy to make a hollow electro-magnet, in the interior of which the experimenter could observe with the minutest accuracy the bearings of all kinds and shapes of bodies in a vigorously uniform field of force. All that is necessary to make such a conductor is to take a hollow *papier-maché* globe, say six feet in diameter, and roll a galvanic wire over its surface in a succession of close parallel circles, having their planes at equal distances from one another. A hollow non-magnetic body, of any shape, cubical for instance, may have a rigorously uniform distribution of magnetic force produced in its interior by a suitable distribution of galvanic wire over its surface, determinable, according to the form of this surface, by the mathematical theory from which these results are stated. But it would be difficult, perhaps practically impossible, to get a sufficient intensity for exhibiting the forces experienced by diamagnetic or weakly paramagnetic bodies in a uniform field of such extent that the operator could himself enter it; and experimenters must be contented either with approximations to uniformity, such as in the arrangement with flat poles, so successfully used by Professor Tyndall in the beautiful experiments which he had exhibited to the Section, or they must arrange to test effects in the interior of hollow electro-magnets without seeing them at the time they are taking place. Interesting questions, which the mathematical theory answers decisively, had also been asked regarding the minimum condition of the central line in a field between opposed flat poles, of two cylindrical soft-iron bar magnets, and the effects of rounding off the edges of these poles. It appears that, if we consider the intensity of the force in a plane perpendicular to the magnetic axis through the centre of the field, we find it increasing from the central point to a certain circle of maximum intensity, beyond which it diminishes gradually and falls to nothing at an infinite distance. If the edges of the cylinders be rounded off, the circle of maximum intensity contracts, its centre always being a point of minimum intensity, until a certain degree of convexity of the poles is attained, when the circle of maximum intensity becomes contracted to a point—the central point of the field—which will then be a point of maximum intensity (the central minimum being eliminated), and will continue a maximum, as regards all points in the plane through it, perpendicular to the axis, for any less flat or more prominent or pointed forms of poles. No form of rounded poles, by doing away with maximum or minimum points, can possibly give a uniform distribution of intensity through ever so small a finite bulk of the field.

"ON THE DEVIATION OF THE MAGNETIC NEEDLE PECULIAR TO LIVERPOOL.

"This paper was read by Sir John Ross, the celebrated Arctic explorer. He said:—'Ever since the year 1799, when my attention was first directed to the deviation of the magnetic needle, I have lost no opportunity of making observations in many parts of the globe, on the interesting phenomena appertaining to that influence—a statement of which has been published by me in the narrative of my first two voyages of discovery to the Arctic regions. Since which my attention was called to the frequent losses of ships consequent on the fallacious system adopted by the Admiralty, called 'adjusting the compass,' at Gravesend and other places; and after the loss of the *Birkenhead*, I felt it my duty to publish a pamphlet, which, although dedicated by permission to

the First Lord of the Admiralty, did not at once obtain their Lordships' approbation, inasmuch as it exposed the absurdity of the system then in practice under the superintendence of a naval officer attached to the Admiralty. But I maintained the truth of my statement; and, after some correspondence on the subject, my assertions were found to be correct, and, consequently, the office of Superintendent of Compasses was abolished, and circulars issued by the Admiralty, not only ordering a monthly examination of the deviation, but that such observation should be instituted at every change of the ship's position, and on every circumstance which was known or supposed to affect the ship's deviation, or local attraction, which is now admitted to be of infinite service. But my attention has for some time been called to the fact of ships sailing from the port of Liverpool, after having been swung in the Mersey, to obtain the amount of deviations, or, as it is called, *to have their compasses adjusted*, that immediately on their proceeding on their voyage, it was found that the deviation observed in the Mersey was incorrect, and there have been lamentable instances of shipwreck in consequence. It has occurred to me that this untoward circumstance is very easily explained. The fact is, that the Mersey is not a locality eligible for ascertaining the true deviation of the magnetic needle, the ships being in a position between establishments in which large masses of iron are deposited, which must have an influence on the magnetic needle during the evolution of swinging the ship, while the embarkation of passengers with their luggage, or anything else subsequent to that process, cannot but have the effect of producing a false and dangerous result to the observations. But this evil is not without an effectual remedy, which is within the power of every captain of a ship after he has left the port of Liverpool, and which will be found in the following proposals. It is proposed that the present method of swinging the ship in the Mersey shall be continued; and, in order to obtain a verification or a correction of results observed at that time, it is proposed to place on the sandhills of Rockland (near the Rock Lighthouse), two posts or beacons, true north and south of each other, in the positions best seen near the red buoy of the Rock Channel, when the ships passing will be steering about true west, or west-north-west, by compass. When these two objects can be brought into one—that is, due north of each (both being south of the ship), either a verification of the deviation that was observed in the Mersey, or the amount of difference to be taken into consideration or account on that particular point of the compass, will be shown, from which a calculation may be made in approximation of the other points; and if, further on, two other posts were erected on the magnetic meridian, the ships, on passing them, when in one with each other, could observe the exact amount of the deviation, either in the increase or the diminution of the variation on the course of the ship, keeping in mind that it will be on the south point of the compass that the observations will be made. Posts placed due south of Lizard Lighthouse would be useful, and also on the magnetic meridian. But all posts or beacons denoting the true north or south bearings, and those further off denoting the magnetic meridian, should be painted of different colours. The former—that is, the true or nearest—should be red, while the latter, showing the magnetic meridian, should be chequered. Great Ormshead and Holyhead should have beacons placed on them which would be observable to ships both outward and homeward bound.

"ON THE MEANS OF REALIZING THE ADVANTAGES OF THE AIR-ENGINE.

"This paper was read by Mr. W. J. Macquorn Rankine, C. E. The paper consisted of four Sections. In the first were explained the two fundamental laws of the mechanical action of heat, and their application to determine the efficiency of theoretically perfect engines, working between given limits of temperature; and it was shown that, as the efficiency increases with the distance between those limits; and, as it is easy to employ air with safety at temperatures far exceeding that at which the pressure of steam would cease to be safe and manageable, the maximum theoretical efficiency of air-engines, consistent with safety, is much higher than that of steam engines. For example, at the temperature of 650° Fahr., at which the air-engine has been successfully worked, the pressure of steam is 2,100 lbs. on the square inch, while that of the air is optional, being regulated by the density at which the air is employed.

"In the second section the various causes of waste of heat and power in steam engines were classified, and the actual efficiency of steam engines compared with their maximum theoretical efficiency, and also with the maximum actual efficiency which may reasonably be supposed to be attainable in the steam engine, by means of any probable mechanical improvements.

"The following are estimates of the consumption of bituminous coal, of a specified quality, per horse power per hour:

"1. For a theoretically perfect engine working between such limits as are usual in steam engines . 1·86 lbs.

"2. For a double acting steam engine improved to the utmost probable extent. . . . . . . 2·50 lbs.

"3. For a well constructed and properly-worked ordinary double-acting steam engine, on an average . . . . . . . . . . . 4·00 ,,

"In the third Section, the causes of waste of heat and power, in air-engines, were classified in a manner analogous to that applied to steam engines; and the actual efficiencies of those previous air-engines, as to which satisfactory experimental data have been obtained, namely, Stirling's engine, and Ericsson's engine of 1852, were compared with the efficiencies of theoretically perfect engines working between the same limits of temperature, the results being as follows, so far as they relate to the consumption of coal of the specified quality per horse power per hour:

| | Actual Consumption. | Consumption of a Theoretically perfect Engine. |
|---|---|---|
| Stirling's Engine............ | 2·20 lbs. | 0 73 lbs. |
| Ericsson's Engine of 1852 | 2·80 ,, | 0·82 ,, |

"It is thus proved that an air-engine has actually been made to work successfully and to realize an economy of fuel considerably superior to that of ordinary steam engines; and, in fact, surpassing the utmost limit to which it is probable that the economy of double-acting steam engines can ever be brought.

"Stirling's engine, as finally improved, was compact in its dimensions, easily worked, not liable to get out of order, and consumed less oil, and required fewer repairs than any steam engine; still the advantages shown by that engine over steam engines, were not so great as to induce practical men to overcome their natural repugnance to exchange a long-tried method for a new one. Another circumstance caused Stirling's and Ericsson's engines to meet with neglect from scientific men: namely, that both were by some persons represented as instances of *power created out of nothing*, the popular delusion commonly called '*the perpetual motion.*' It is shown, that Stirling's air-engine, as compared with a theoretically perfect air-engine, wasted two-thirds of its fuel; and Ericsson's somewhat more.

"Two obvious and powerful causes of that waste of fuel were traced:

"1. Deficiency in extent of heating surface. 2. The communication of heat from the furnace to the working-air at those periods of the stroke when it is not performing work.

"The necessary conclusion is, that the more completely we remove those two causes of waste of fuel, the more nearly shall we approximate to the theoretical extent of the economy of the air-engine, an extent far exceeding that to which the economy of the steam engine is restricted; and the more fully, in short shall we accomplish that which has hitherto been very imperfectly done—*to realize the advantages of the air-engine.*

"The fourth section described the improved air-engine of Messrs. James Robert Napier, and W. J. Macquorn Rankine. In this engine the heating surface is increased to any required extent by means of tubes employed in a peculiar manner. The waste of heat by its communication to the air at improper periods of the stroke, is prevented by a sort of plunger, or combination of plungers, called the *heat-screen*, which prevents any access of the air to the heating surface, except when it is in the act of expanding, and so performing work. The engine may be made of the same size with a steam engine of the same power, or smaller, according to the degree of condensation at which the air is employed. The air-receivers of an experimental engine, with their various fittings, were completed some time since, without practical difficulty, notwithstanding the novelty of their construction; but the erection of the engine has been retarded by delay in the execution of the cylinder, flywheel, shaft, and other parts, which are similar to those of a steam engine.

"Independently of the amount and value of the saving of fuel, which will result from the introduction of the air-engine, it possesses the important and incontestable advantage, that even should an air receiver burst (which is very unlikely) the explosion would not be felt beyond the limits of the engine itself; and hot air does not scald.

"ON MAGNETO-ELECTRICITY AND UNDERGROUND WIRES, AS APPLIED FOR TELEGRAPHIC PURPOSES.

"In a paper on the above subject, Mr. Edward Bright said:—Magneto-electricity, as well known, is the current induced in a coil of wire when moved before the poles of a permanent magnet, a positive current being manifested at one end of the coil, and a negative current at the other, upon any movement of the coil before the poles. The greatest development of induced currents occurs when the coil is electro-magnetic (the helix of wire wound upon a soft iron core).

"As applied to telegraphic purposes, the iron core of the coil, when at rest, partly serves as a keeper to the magnet, though not actually in contact with the poles; and when worked by a key attached to the axle, the coil moves freely before the magnet, generating a current with each change of position, which is applied to actuate indi-

cators or ring bells at a distance. This principle constitutes the system of the Magnetic Telegraph Company; all other companies in this kingdom and America have adopted the galvanic battery.

"The generating magnets have remained unimpaired in strength during three years of constant use (a period in which a dozen consecutive series of voltaic batteries would have been worn out).

"The magnetic currents thus generated can be passed through subterranean wires, to a distance of 660 miles (the utmost extent of such conductors in England), without any break or renewal of circuit.

"The return (or recoil) current from underground wires, which has interfered with the working of other telegraphs, is applied in the magnetic apparatus to assist in working it; being made to keep the indicating needles at zero until actuated from a distant station.

"A remarkable feature in underground wires is the small comparative velocity with which the electric sensation passes through such conductors. Professor Wheatstone's experiments on a short length of wire in a room have demonstrated that *frictional* electricity passes at nearly 300,000 miles per second (this variety cannot, however, be practically applied for telegraphic purposes). Professor Walker's (America) give the speed of galvanic electricity through overground telegraph wires at only 16,000 miles per second; while, lastly, experiments conducted by the engineer of the Magnetic Company and myself, on an underground length of about 500 miles of gutta percha covered copper wire, show that the transmission of galvanic or magnetic currents through such conductors varies from 960 to 1,700 miles per second, according to the intensity of the current employed.

"This diminution in velocity, as regards the underground wires, is intimately connected with the recoil current recently analyzed by Dr. Faraday, and proved as due to the analogy between such conductors and a Leyden jar, the electricity communicated being temporarily absorbed by the wire until the mass of copper is saturated with electricity; hence retardation ensues.

"From the foregoing, I deduce that the speed with which electricity passes varies with the energy (that is, intensity) of the current employed, and also with the nature or conditions of the conductor interposed through which it passes.

"*Underground* wires are only affected by terrestrial electricity, when a flow takes place from *one district* of the earth's surface to *another;* while *overground* wires are also subjected to the action of perturbative currents whenever the electrical *status* of the atmosphere changes as regards the earth—principally during the rising or falling of the dew—*aurora borealis*, &c.

"In the *Quarterly Review* for June, 1854, a very unjust and erroneous comparison is instituted between the English and American scale of charges for telegraphic messages, the American rate being stated to be about one-tenth that of this country.

"To correct such a statement, which is calculated seriously to prejudice the English companies with the public, I should mention that considerably prior to the publication of the Review the charges in England were considerably lower than in the United States; and that instead of the cost of a message of twenty words between Louisville and Pittsburgh being 20 cents, or 10d., the American charge (as proved by the tariff of the American Telegraph Confederation, published at New York, in April last) was 3s. 6d.; while the English rate for a similar message, transmitted an equal distance, was 2s. 6d. And in another case the Quarterly states the charge between New York and New Orleans to be 2s. 7d. for ten words, whereas the charge is 10s. The economy of system claimed for America does not exist, but the advantage is on the English side." The lecture was accompanied and illustrated by experiments.

## ON THE PRODUCTION OF PYRO-ELECTRIC CURRENTS.

BY M. BECQUEREL.

THE disengagement of electricity is produced by various means—friction, heat, light, the action of magnets, induction, molecular and chemical actions, &c. I have endeavoured to produce the electric force by combining the action of heat with that of the affinities. My expectations have been realized; I have succeeded in producing currents which I shall call *pyro-electric currents*, by analogy with the currents obtained in the ordinary batteries, and to distinguish them from the thermo-electric currents, which are due to heat alone.

These currents, which have a constant power as long as the temperature does not vary very sensibly, are produced whenever solid metallic or other substances, conductors of electricity, are in contact with glass or any other vitreous substance in a state of igneous fusion, or softened by heat; but the greatest effect takes place only when the substance is fused.

In the memoir which I presented to the Academy on the 1st of May last, on the disengagement of electricity in chemical actions,* I showed that glass, even at a

* "Phil. Mag." for July, 1854.

slightly elevated temperature, began to conduct electrical currents, and that this property might be made use of to study the disengagement of electricity produced by the contact of platinum wires with flame. This conductibility begins to be sensible at about 482° F. I have since tried to ascertain whether, this conducting power increasing with the temperature, it would not be possible when the glass is fused, or even before this takes place, to substitute it for the acids and saline solutions in voltaic batteries. I operated in the following manner :

*First experiment.*—If a rod of soft iron and a rod of copper be introduced into a furnace filled with lighted coals, each of them being in communication with the ends of the wire of an ordinary multiplier, by means of an iron and a copper wire, the magnetic needle is not deviated, whatever may be the temperature. But it is very different if the copper rod be inclosed in a tube of hard glass, and the temperature be brought to the point of fusion of the latter. If a multiplier and a tangent galvanometer be placed in the circuit, it is seen that long before the glass has become red-hot, the needle of the multiplier deviates; by continuing the heat up to the melting-point, the intensity of the current constantly increases, attains a maximum, and remains constant. Long before this it is necessary to take away the multiplier and only make use of the tangent galvanometer; this current is directed from the iron to the copper, across the charcoal and glass; that is to say, the iron during its oxidation disengages negative electricity, and the copper, of which the surface remains clear and bright, evolves positive electricity. Thus the copper, although exposed to a high temperature, remains intact, as is also the case when, in contact with zinc or iron, it is immersed in an oxidizing liquid. It is consequently indebted to its electro-negative state for its preservation at an elevated temperature. The current remains constant as long as the temperature undergoes no sensible variation and the iron does not become covered with a thick layer of oxide; but should the tube partially fuse and the copper touch the iron, all the signs of electricity disappear. This fact proves that the current is not thermo-electric.

The disengagement of electricity, under these circumstances, is due therefore both to calorific and chemical causes. Whilst the iron is becoming oxidized it acquires a negative electricity, the surrounding air taking the positive electricity, which is transmitted to the copper by the medium of the red-hot coals and glass with which the gases are in contact.

*Second experiment.*—To ascertain the relation existing between the current produced by the pyro-electric couple and that arising from a Bunsen's couple of equal conductibility, I placed in the same circuit a pyro-electric couple, and another with nitric acid, of which the elements were of the same dimensions. These two couples were placed successively so that the currents passed in the same and in contrary directions.

Representing the intensity of the current furnished by the Bunsen's couple by $x$, and that of the pyro-electric current by $y$, it was found with the tangent magnetoscope that

$$x+y=\sin 17°=29237,$$
$$x-y=\sin 10°=17365;$$

whence $x=23301$, $y=5936$, and consequently $x : y : : 3\,9 \cdot 1$. Under the circumstances of my experiment the intensity of the pyro-electric current was therefore only a fourth of that of the nitric acid battery.

We have already seen that sufficient heat for the complete fusion of the glass must be avoided, as the iron and copper then soon touching, all the signs of electricity would gradually disappear; but there is another cause which diminishes the intensity of the current, the oxidation of the points of junction of the metallic wires and the rods of iron and copper, when they are very near the hot furnace; this inconvenience is got rid of by employing long rods, which enable the points of junction to be removed to a distance from the furnace.

*Third experiment.*—By the substitution of a cylinder of charcoal prepared in the usual manner for the iron rod, connecting it by means of a platinum wire with the tangent magnetoscope, a current passing in the same direction as that furnished by the iron and copper, was produced. In this case then we have the current resulting from the combustion of the charcoal.

By comparing in the same manner as with the iron, the current produced by charcoal and copper with that of a nitric acid couple, the following results are obtained,—

$$x+y=\sin 14°\cdot 30=25038$$
$$x-y=\sin \;\; 8°\cdot 50=15367,$$

hence $x=20197$, $y=5340$, and consequently $x : y \,.\,.\, 3{\cdot}76 \,.\, 1$.

*Fourth experiment.*—To compare these two sources of electricity exactly, it is necessary to determine, by means of Ohm's law, the conductive power of the sources themselves. The experiments which I have hitherto made show, that under the most favourable circumstances, when the temperature approaches the melting-point of copper, the conductive power of the two sources is nearly the same, but in proportion to the distance from this point the re-

sistance gradually increases in the pyro-electric couple.

*Fifth experiment.*—The pyro-electric currents produce chemical decompositions like other currents.

With two plates of platinum and a Bunsen's couple, water is decomposed pretty rapidly, whilst with a pyro-electric couple acting at a temperature far below the melting-point of copper the current is distinctly stopped, at least if the positive platinum plate be not replaced by a plate of copper; in this case the disengagement of hydrogen gas is tolerably abundant. The same thing takes place when a solution of sulphate of copper is substituted for the acidulated water; with two plates of copper the sulphate is decomposed.

*Observations.*—The pyro-electric couples may be prepared in various ways: I shall mention three:

1. Into an ordinary reverberatory furnace, an earthen crucible is introduced, lined internally with a thick plate of copper, turned so as to fit the interior of the crucible, and furnished with a wire of the same metal passing through an earthen tube to preserve it from oxidation. The crucible is filled with pounded glass, in sufficient quantity to cover the plate of copper, when fused, to a thickness of two centimeters. In contact with the glass, and resting vertically upon one end, is placed a bar of iron, long enough to pass through the top of the furnace; to the upper end is attached a wire of the same metal, which serves both to maintain it in its proper position and to connect it with the tangent magnetoscope or any other apparatus.

2. After filling the crucible with pounded glass to which 0·25 of carbonate of soda has been added to hasten the fusion, two long rods of iron and copper are introduced into it, and maintained in a vertical position, without contact, by means of iron and copper wires attached to their free extremities, which also serve as conductors. As soon as the glass is fused, the oxide of iron formed is dissolved, and the surface of the iron rod always remains clean, so that the current remains constant. A heat sufficient for the fusion of the copper must be avoided. The current has a certain intensity long before the fusion of the glass.

3. A tube of green glass, enclosing a cylinder of copper, is put into a pistol barrel and all the interstices filled up with pounded glass; the whole is then placed horizontally in a proper furnace, and the pistol barrel and cylinder of copper connected with the other apparatus by means of wires of the same metals. This arrangement has given me the best results.

*Sixth experiment.*—In the pyro-electric couples just described, copper has been employed as the electro-negative element; but platinum and coke may also be used, although both of them present certain disadvantages. The platinum is attacked by the glass and disintegrated; the coke burns very slowly and produces a current in the opposite direction, which diminishes the action of the current resulting from the oxidation of the iron. It is possible, I think, to get rid of this inconvenience by introducing a cylinder of coke into an earthen tube and closing the openings with earth to prevent the circulation of air.

*Observations.*—Glass is not the only vitreous substance which may be employed; amongst those tried by me, I will mention borax, which, however, I gave up because it attacks the elements of the couple too rapidly. Common salt and nitrate of potash give but feeble actions, unless the latter salt be employed with coke—a couple which gives a very powerful disengagement of electricity at the moment of deflagration of the coke; but from its rapid action and the danger attending it, this couple cannot be made use of.

Sand and pure quartz, whatever temperature they may be exposed to, never acquire the conductive power, and cannot be substituted for glass or the alkaline silicates.

The facts described in this note, show that the lost heat of factories may be employed to set in action pyro-electric couples, producing currents which partake of the nature of hydro-electric and thermo-electric currents. They also render it probable that terrestrial-electric currents exist, at the point of contact of the solid part of the globe with the fused portion, where solid conducting substances are partially imbedded in fused silicates, in the same way as in pyro-electric couples.—*Philosophical Magazine, from Comptes Rendus.*

## TURKISH RECIPES FOR HYDRAULIC MORTAR AND CEMENT.*

As the aqueducts of Constantinople are attracting additional notice the more they are studied and examined, being astonishing works (especially if we take into account the infant state of chemical and manufactorial science of the Turks), the following recipes will be found of interest, and deserving of examination and trial. It is, moreover, a curious fact, that other semi-barbarous nations, also, are in the possession of mechanical procedures and contrivances, inaccessible even to European science and art; as,

* From the *Allg Bauzeitung.*

for instance, the art of the Chinese to unite (solder) cast iron, &c.

*Lime Mortar.*—It is prepared with fresh water, and mixed with two parts of powdered lime (*Staub Kalk*) and one part of river sand.

*Hydraulic Mortar.*—Bricks are pounded until the grains attain the size of common river sand, and one part of the brick-powder is mixed with two parts of powdered lime, and the necessary quantity of fresh water. In using this mortar a layer of mortar is placed between the bricks or courses of bricks, of the *same* thickness as the brick, which must have been previously soaked in water; the latter is not to be neglected.

*Hydraulic Cement*, for the internal dressing (*Putz*) of arched aqueducts, cisterns, baths, and generally all constructions through which water flows or is kept in. Take 100 *ocka* (of 2¼ lbs., of 16 ounces) of fluid lime, and 4 *kilots* (at 22 *ockas*) and 2 *ockas* of very minutely-plucked tow (*Werg*), which is to be distributed very accurately throughout the mass. If these two ingredients have been duly mixed and worked up, the mass thus obtained has to remain quiet during at least eight days, that the tow may have time to combine thoroughly with the lime. If the mortar is to be used, it is again to be well stirred up, and is to be spread with a small trowel; and after this first operation has been performed, the dressing (*Putz*) is yet to be rubbed gently but repeatedly with the trowel, until the surface is quite smooth and plain. For the sake of protecting it still more from the action of the water, and to make it durable for a long time, it is then to be coated by a putty (*Oelkitt*), which is called *lukin*, and is thus prepared. To 100 *ocka* of freshly-burnt lime, which has become converted into dust, 25 *ockas* of the best linseed oil are added, as well as 20 drachms (1 *ocka* = 2¼ lbs. = 400 drachms) of rough cotton. The lime is to be worked and mixed in a wooden chest or trough, while the linseed oil and the cotton are added in succession, until the mass has obtained the consistency of dough. This mass is preserved, making of it large pieces resembling loaves of bread. If it is to be used, it is stirred up with linseed oil, until it becomes fluid, and fit to make a coating, which is painted over twice or thrice. In employing it for lead water-pipes, it is thus used. The lead pipes are made of a length of 0·65 *m*, and first cemented in their whole length, only at the other end, 0·16 *m*, is left free for being able to unite them. If two of these pipes are to be united, one of the ends of the pipe is cut perpendicularly into several pieces with a hand-saw, and they are bound around in the shape of a funnel. We then take some well-combed long-threaded hemp, soak it with lukium, and cover with it the end of the pipe, A, which is to be united to the pipe, B, in such a way that the hemp bundles (*Hanfstränge*) lie close to each other; but, at the same time, these envelopings are to be so arranged that only one-half of the length of these hemp skeins has been employed. The end of the pipe, A, thus prepared, is then placed in the funnel-shaped end of the pipe, B; and the cut asunder portion of the pipe end, B, is then to be compressed by the remaining portion of the hemp. This envelope, as it were, of hemp is then tied over with a string of about 3 lines diameter in such a way, that the threads lie close to each other. If these cements have become dry, they acquire the hardness of stone, resist all moisture, and possess an indestructible durability. If the pipes lie in an ascending position, two such cementations are to be made, for obtaining an adequate resistance; for those lying in the ground, one is sufficient. The pipes thus united are placed in small drains, supported at intervals, for avoiding this bending, and surrounded by mortar mixed with brick-dust. If the pipes treated in that way have a large diameter, the whole is to be well dried before the water is let in, a precaution unnecessary with small pipes.

## ON THE CONSTRUCTION OF AIR-VESSELS; AND ON OTHER MATTERS INFLUENCING THE CHARACTER OF JETS D'EAU.

BY MR. W. BADDELEY.

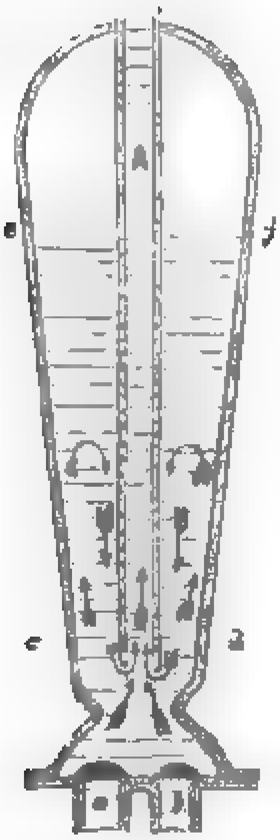
The air-vessel is, in hydraulics, what the fly-wheel is in mechanics; each has, to some extent, similar offices, both of them acting as regulators and absorbers of power while it is in excess, to be restored as soon as a deficiency arises; and as preventives of those jars and concussions which are incident to all non elastic bodies in rapid motion. Great judgment is required in the application of these useful agents, in order to realize all the advantages they are calculated to afford. The proper application of the fly-wheel has received considerable attention from various writers on mechanics, while the air-vessel has been much neglected. An American writer on hydraulics observes, that "few parts of an engine receive less attention than the air-vessel." Having in a former communication* treated of the application of air-vessels to suction-pumps, I will endeavour, on the present occasion, to point out the peculiarities of some of the forms of air-vessels as ap-

* Vol. lix., page 425.

plied to force-pumps in common use, with a view to determine the principles which should regulate their construction and employment.

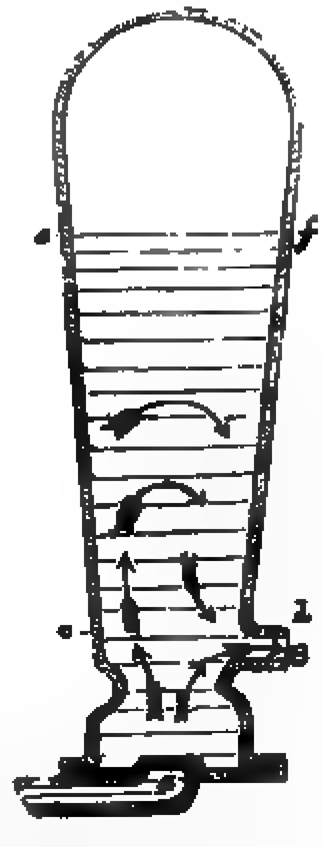
The most ancient form of air-vessel, and one of the best with which we are acquainted, is that applied to the force-pump of Ctesibius of Alexandria, two thousand years ago, and which is almost identical with the air-vessel employed in the fire-engines of Fowke and Newsham, at the beginning of the eighteenth century, and still in use to this day. Such an air-vessel (or air-chamber, as they are indifferently called), is shown by the accompanying section, fig. 1.

Fig. 1.




Water is forced by two pumps alternately, through the passages, *a* and *b*, each covered by a loaded valve opening upward; as soon as the water rises to the level, *c d*, any further escape of air by the exit-pipe, A, is prevented, and as the action of the pump continues, the imprisoned air becomes condensed into a smaller space, in proportion to the resistance offered to the escape of the water by the contraction of the nosel or jet-pipe. The dimensions of the latter are usually so regulated, as that when the engine is working at its maximum speed, the air is condensed into about one-third or one-fourth of its original volume, as represented by the water-line, *e f*. On entering the air-vessel, one portion of the water passes directly up the rising-main, A; another portion passes into the body of the air-vessel, increasing the bulk of the water therein. During the short interval between the change of motion in the pumps, the elasticity of the condensed air acting upon the surface of the water, forces a portion of it up the rising main to compensate for the non-supply from the pumps, until their renewed action furnishes a fresh injection. So that the air-vessel is alternately receiving and ejecting water, and the water-level, *e f*, is continually oscillating; the currents taking the directions indicated by the arrows, and but slight interference taking place between their respective motions. In many cases, instead of a rising main, an outlet is made at B, fig. 2, which

Fig. 2.

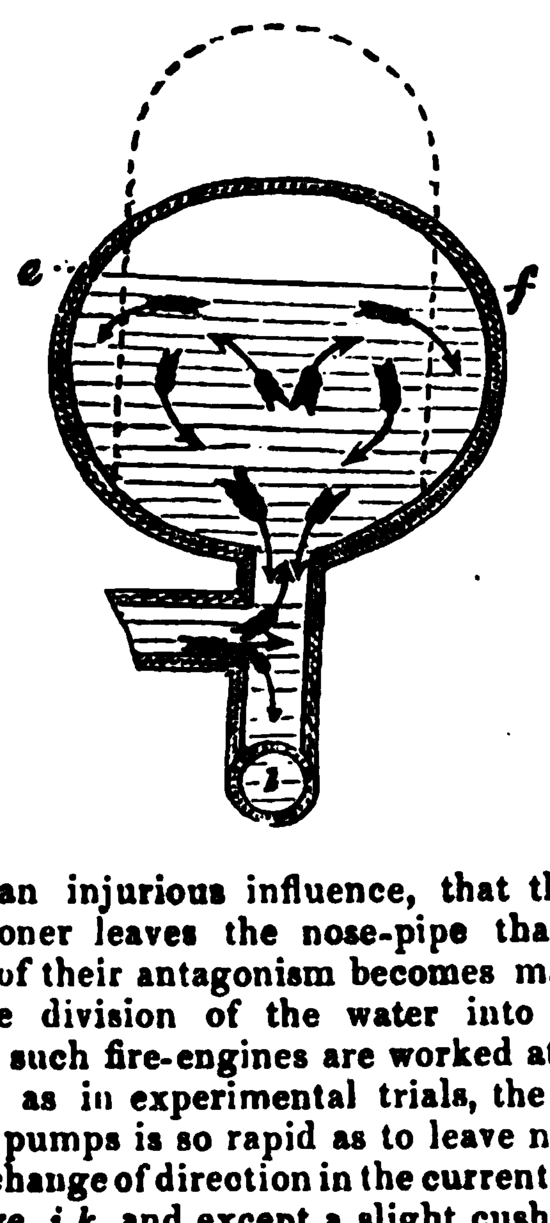



is a preferable arrangement, the space otherwise occupied by the rising main being added to the internal capacity of the air-chamber, and there is even less interference between the entering and effluent currents.

As the *ancient* force-pump affords one of the *best* examples of an air-vessel, so the *modern* fire engine furnishes the *worst* with which I am acquainted. Fig. 3 is a section of a spheroidal air-vessel, as used in the best modern fire-engines; the streams of water delivered alternately by the two pumps, after passing through the valves, are forced along a passage, *g*, and striking against the end at *h*, are forcibly deflected at right angles and divided into two parts, one portion passing downward to the right angled outlet-pipe, *i*, the other portion of the water going up into the air-chamber, *k*; *e f*, as before, represent the oscillating water level.

During the change of motion in the pumps the upward current is met and overcome by the downward current produced by the re-acting elasticity of the condensed air. This downward current being, in its turn, met and overcome by the renewed operation of the pump; so that, in this arrangement of air-vessel, where a single passage serves for both inlet and outlet, a violent and continual antagonism is always going on in the water passage between *i* and *k*. Under such disadvantageous circumstances, whatever power may be employed, it is almost impossible to obtain either a compact or steady jet of any considerable height. As the speed of working increases, the action of the contending current becomes more violent, and exerts

Fig. 3.




such an injurious influence, that the jet no sooner leaves the nose-pipe than the effect of their antagonism becomes manifest by the division of the water into spray. When such fire-engines are worked at great speed, as in experimental trials, the action of the pumps is so rapid as to leave no time for a change of direction in the currents in the passage, *i k*, and except a slight cushioning by the elasticity of the compressed air, just sufficient to prevent a rupture of the apparatus, the air-vessel is inoperative; the water ejected by every stroke of the pumps is delivered in a palpably distinct form, and the jet is composed of a series of rapidly succeeding pulsations, instead of being uniform and homogeneous.

As the spherical form of air-vessel possesses several important advantages, it is desirable to show that the defects arising from the foregoing mal-arrangement are not necessarily inseparable from that form. It is only necessary to provide separate inlet and outlet passages, to avoid nearly all the evils pointed out. Thus, fig. 4, shows a spherical air-vessel, to which the water is admitted by the pipe, *m*, and passes over in curves to the outlet-pipe, *n*.

Fig. 4.

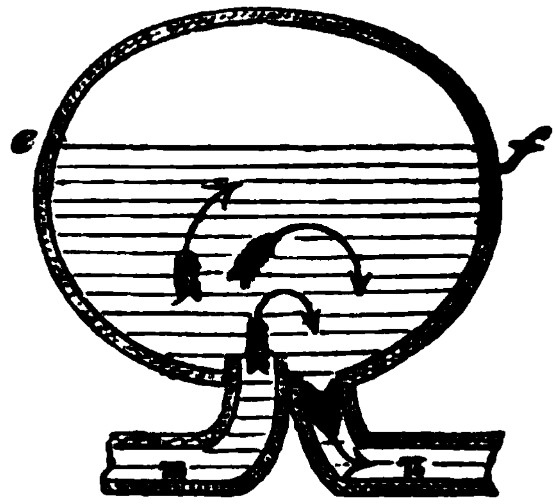
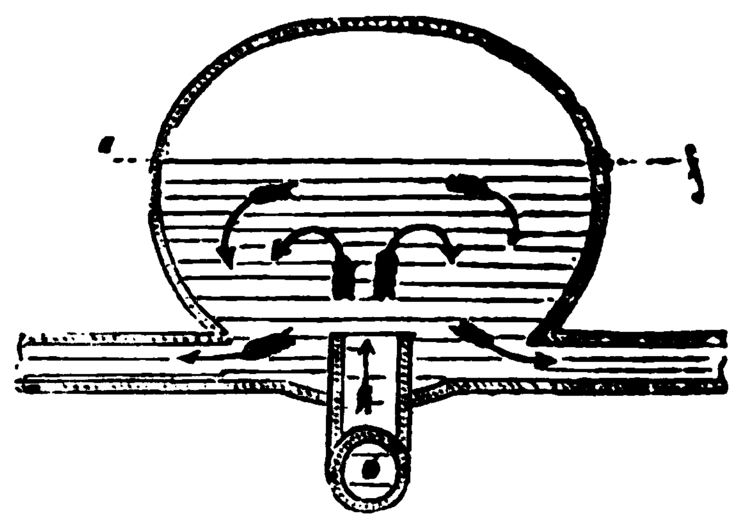



Fig. 5 shows another arrangement, which may be used with advantage in fire-engines

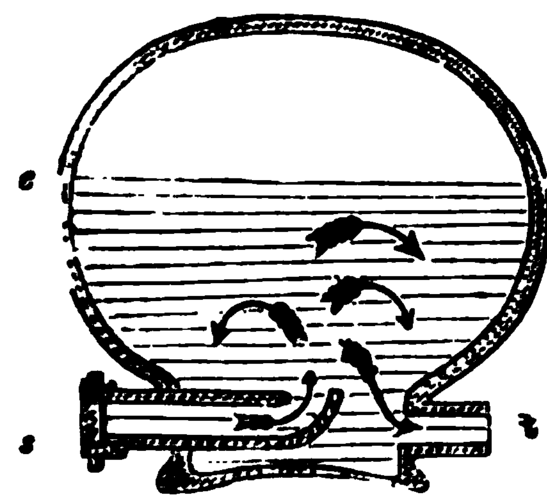
Fig. 5.



having two delivery orifices, one on each side, as most large engines have; *o* being the intlet, and *p* the outlet passages. In each of the two last proposed arrangements, a very limited amount of interference takes place between the entering and effluent currents; the streams from the pumps being discharged into the mass of water in the air-chamber, any previously acquired currents become absorbed, and the jet issues from the outlet pipe under the influence of the condensed air alone. Besides a defect in the construction and application of the air-vessel, however, other circumstances may operate to mar the effect of a jet; such, for instance, as the length and malformation of the water-passages between the air-vessel and the nose-pipe. A striking example of this kind is furnished in the floating steam fire-engine on the Thames. In this powerful machine, there are two engines, two pumps to each, working into an air-vessel (of inadequate dimensions) the form and arrangement of which are illustrated by the dotted lines on fig. 3. From the air-vessel, the delivery mains, *i*, proceed downwards and are connected by cross pipes in two places, with slide-valves and other obstructions, ren-

nd necessary to provide against various tingencies. Each main then rises through deck of the boat, and terminates in a s elbow screw, to which the leather hose fixed. It almost invariably happens that re this engine can be brought to bear a a fire, a great length of hose has to be ched, at the end of which dividing ws are applied to lead off the jets, as may equired. Under such a combination of avourable circumstances it is not surding that the height of the jet obtained is no means commensurate with the power loyed. A remedy for these evils might found in taking the original stream di- from the air-vessel (as shown in fig. 2), also by the employment of a portable plementary air-vessel, to be attached he end of the principal line of hose, as r as possible to the point at which the are required. Fig. 6 shows a design for

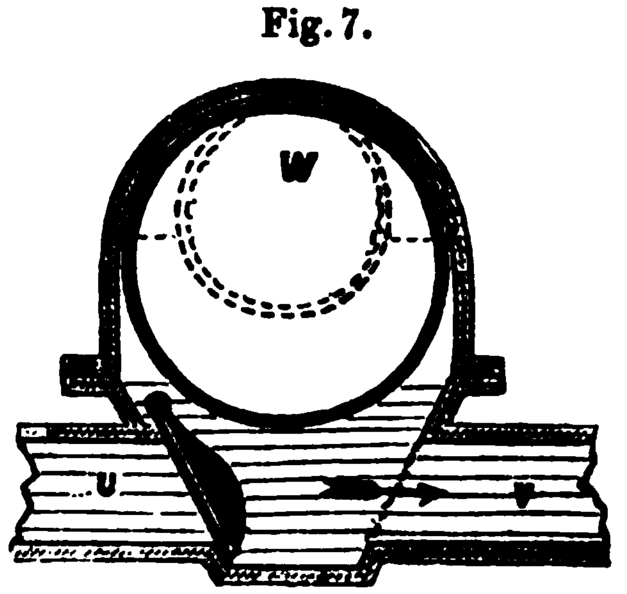
Fig. 6.




h a portable air-chamber; a female w at *s* receives the end of the leather e, from which a curved opening delivers stream of water upward into the body of chamber; *t*, is one of three male screws, nished with caps for closing those not in . To the screws, *t*, dividing screws may attached, so as to afford a ready means pplying from one to six lines of hose, throw as many jets as may be required. the eddies and hostile currents produced the stream of the water from the engine l, for the most part, be got rid of by adcture with the mass of water in the plementary air-chamber, the effluent ams, freed from their deteriorating inences, would be productive of jets, comt and uniform in character, and of a ght corresponding to the extent of power ployed.

Nor is it for the production of jets alone t supplementary air-chambers may be d with advantage: whenever the motion pumping engines of water-works is slow l intermittent, and the distance and eleion of the delivering orifice is considere, supplementary air-chambers will prove reat safeguard to the mains. Some years since, the Lambeth Water Company proposed to drive water into an elevated reservoir on Brixton-hill, by means of a powerful steam-engine at their works in Belvidere-road, Lambeth. Before the works were completed, I informed the secretary of the company that the first attempt would burst the mains. On making the trial some months afterwards, the mains blew up at Kennington, doing very considerable damage. The injuries having been repaired, another attempt was made with a similar result, and ultimately the water was delivered into a reservoir upon a lower level. In this case an air-vessel was attached to the pumping engine, the motion of which was necessarily slow, and the water was transmitted in a series of pulsations, which formed oscillating columns in the main. When these columns became of considerable length and altitude, the times of oscillation became such, that at last a powerful returning column met the advancing one, and, as I had foretold, a concussion of such violence ensued as no strength of pipes could long withstand. Had the distance between the reservoir and the waterworks been subdivided by the interposition of supplementary air-chambers, the water might have been forced up into the highest reservoirs with safety. Fig. 7 shows a form of air-

Fig. 7.




vessel well adapted for this purpose. U is the entering-pipe closed by a valve, to intercept returning currents; V the outlet-pipe; and W the air-chamber. In order to prevent absorption of the air, which would otherwise take place, I would suggest the introduction of an India-rubber ball, filled with atmospheric air of the ordinary density, as shown; an expedient that might be resorted to with very great advantage in water-rams, and other hydraulic engines. The dotted lines indicate the position of the ball under pressure.

I very recently heard an engineer, of considerable celebrity, publicly assert that "an equable and steady jet could not be obtained from a pumping engine; that all

such jets were necessarily spasmodic." Such, however, is not the case. I have repeatedly obtained a beautiful steady jet from a single barrel-pump; but the effect is more certain when a larger number are employed. Three barrels, worked by a three-throw crank (as the floating fire-engine in St. Katharine's Dock), is an arrangement admirably adapted for the production of a jet of the best description.

Many experiments have been made to determine the best form of ajutage or jet-pipe; but it unfortunately happens that nearly all these experiments have been made with apertures opening either immediately out of the reservoir, or out of short and capacious tubes connected therewith, in either of which cases little or no disturbing influences would arise. From experiments made under these favourable circumstances, the Newtonian theory of the *vena contracta* giving the most suitable form of ajutage, was supposed to be established. In ordinary practice, however, especially in the case of fire-engines, so many disturbing elements are continually and unavoidably present, that the Newtonian form of ajutage no longer meets the requirements of the case. The pertinacity with which currents of water retain an impression once made is somewhat remarkable. One well known instance is afforded by the shining track which marks the path of a ship through the sea, occasioned by the direction given to the particles of water by the ship's motion, which they retain for a considerable time, notwithstanding the obliterating action of the waves. At a trial of fire-engines many years ago I observed a visible indent in the jet issuing from the nose-pipe, which I found to be occasioned by a small screw (used for securing the hose) which projected into the water-way of a connecting-screw, at a distance of 120 feet from the nosel. When the hose happened to be laid in a twisted direction the jet assumed a spiral motion on its axis, made strikingly apparent by the indent before alluded to.

The old-fashioned long and gradually tapering branch-pipe, with a nose-pipe to match, has the advantage of gradually wire-drawing and consolidating the jet, and diminishing the effects of adverse influences better than any other. Whatever form of branch and nose-pipe are employed, it is essential that the internal surface should be continuous throughout, quite free from any break or projection whatever, a *sine qua non* seldom or ever attended to by engine-makers. The necessity for smoothness and regularity in the water-passages, freedom from contractions and enlargements, as well as the avoidance of all sharp or sudden turnings, is strongly insisted upon by all writers on hydraulics, and universally admitted to be correct in *theory*, while in *practice* each of these matters is wholly disregarded, as refinements of no real importance. When a *jet d'eaux* is the object sought, whether for useful or ornamental purposes, perfection will be most nearly obtained by a careful attention to the proper formation of the water passages, and by receiving the stream of water, from whatever source, into a capacious air-chamber in close proximity to the jet-pipe. For this reason an air-chamber should always be affixed to the jet-pipe of fountains supplied by elevated reservoirs of water, an adaptation really indispensable, although not usually supposed to be necessary.

We not unfrequently find scientific writers taking the *velocity* of a jet as the true measure of its *height*, and *vice versâ*.* That this is an error, may be proved in the following manner: let two pumping engines of similar capacity, and working at the same speed, deliver their respective streams through unequal lengths of pipe, say one through 20 feet, the other through 400 feet, the *velocity* of the jets must be the same, but the *heights* of the jets will differ.

## ON WATER AS A CONDUCTOR OF ELECTRIC CURRENTS.

*To the Editor of the Mechanics' Magazine.*

SIR,—In your number of the 30th ult. Mr. Baddeley, in referring to my letter of the 18th, again asks, "Why is not water more extensively used as a conductor?" and will not admit that the resistance of water to the passage of an electrical current is so important as I stated.

Water is not at all used in the sense he implies; and is so imperfect a conductor, compared with metals, as to render its substitution for metallic conductors practically impossible. This small degree of conducting power is so well known to electricians that I need not occupy your space by quoting authorities; so small indeed is it, that a tube of water *a yard long* offers more resistance to the passage of a current than *a thousand miles* of iron-wire of equal diameter.

It is not necessary to enter into the greater difficulty of maintaining good insulation with water conductors, or in speedily repairing defects, and other things obvious to telegraphists as important arguments against the use of water in the manner Mr. Baddeley proposed, as its bad conducting power is decisive.

* Vide Report of Jurors, Class V., page 180, Exhibition, 1851.

In the experiments he alludes to, no passage of the electrical sensation took place *through* the Serpentine, Thames, or Channel. There is a great difference between the equalization and the transmission of a current. The earth being the universal reservoir to which all free electricity from other bodies tends to return, the current transmitted through an insulated wire passes into the water or moist earth forming part of our globe, with which it is connected at both ends, and is at once *absorbed*, this being the process of equalization; but there is no return whatever of the sensation to its starting point through the intervening water or moist earth.

No such displacement of atoms, as Mr. Baddeley speaks of in the latter part of his letter, takes place.

I am, Sir, yours, &c.,
CHARLES T. BRIGHT.

Liverpool, Oct. 2, 1854.

## PATENT FIRE ENGINES.

*To the Editor of the Mechanics' Magazine.*

SIR,—Having for many years past made the fire engine my study, and taking much interest in its improvement, I read with some care the abstract of the specification of Messrs. Marsden's patent (No. 480) at page 305 of your last number. In what the *improvement* consists, however, I am wholly unable to discover; the description given being precisely that of fire-engines as they have been constructed for the last fifty years or more.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

13, Angell-terrace, Islington, Sept. 27, 1854.

## HYDROSTATICAL INQUIRY.

*To the Editor of the Mechanics' Magazine.*

SIR,—A gentleman of my acquaintance asserts "that a laden boat (say of 50 tons), in ascending *through* six locks of a canal, will require less water from the upper part of the canal than the ascent of a wine-cork through the same number of locks; and the same will be the case in returning through the same locks; that is, *less* water will be required in either case.'" Any discussion of the circumstances, or any opinion on the subject from any of your numerous correspondents, will be esteemed a favour by your constant reader,

T. T. W.

Burnley, Sept. 30, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

BARLOW, HENRY BERNOULLI, of Manchester. *Improvements in waterproofing and finishing textile fabrics and yarns.* (A communication.) Patent dated March 8, 1854. (No. 548.)

The patentee claims the waterproofing of fabrics and yarns, by rendering them to a certain extent repellent of water, and the imparting of a finish of bright, lustrous, or glossy appearance on plain or coloured fabrics or yarns, by impregnating them with chloride, acetate, and nitrate of copper, acetate and nitrate of lead, acetate and nitrate of bismuth, or any other salt or compound of such metals, except the sulphates, and decomposing such acetates, nitrates, chlorides, and other salts or compounds of those metals, except the sulphates, by means of sulphuretted hydrogen, either generated as a gas or by the decomposition of a sulphuret by steam, or by the employment of a volatile compound of sulphur, capable of forming on the fabric or yarn a sulphuret with the metals above mentioned.

BEARDSLEY, GEORGE, of Coal-pit-lane, Nottingham, lace maker. *Improvements in round or circular machinery for the manufacture of textile and looped fabrics.* Patent dated March 8, 1854. (No. 550.)

The patentee claims the addition to round or circular frames for the manufacture of textile and looped fabrics, of a looped presser wheel or wheels, for the purpose of producing in one or both sides of the fabrics loose loops, to be subsequently formed into a fleeced surface.

BOYELL, RICHARD, of Derby-road, Nottingham, plumber. *A portable safety-guard for the prevention of fire, applicable alike both to public and private buildings, and which said portable safety-guard is also applicable as a reviver.* Patent dated March 8, 1854. (No. 551.)

This portable safety-guard consists of a plain or ornamental sheet of metal, which is fitted to a fire-grate so as to cover the grate containing the fire, either wholly or partially, as may be required. A valve is fitted to the guard, through which air may be admitted to the fire when the guard is used as a reviver.

COOKSON, WILLIAM ISAAC, of Newcastle-on-Tyne, gentleman. *An improvement in the reduction of lead ores.* Patent dated March 8, 1854. (No. 553.)

This invention consists in the use and application of metallic iron, or oxide of iron, or calcined iron pyrites, in the process of smelting or reducing lead ore, whereby the sulphur contained in the ore by being caused to combine with the iron will be

saved, so that it may be used in the arts, the iron or oxide of iron being, by the subsequent separation of the sulphur therefrom, reduced to a state to be again employed in reducing fresh lead ore.

LOSH, WILLIAM SEPTIMUS, of Wreay Syke, Cumberland, gentleman. *Certain means of decolouring resins.* Patent dated March 8, 1854. (No. 555.)

The patentee claims the decolouring of resins (previously subjected to the action of an alkaline solution), by treating them with sulphurous acid gas or chlorine gas, either separately or conjointly.

WARNE, WILLIAM, of Lower Blowing-house, St. Austell, Cornwall. *Improvements in tubular steam boilers or generators.* Patent dated March 8, 1854. (No. 558.)

This invention consists in constructing steam boilers or generators with numerous tubes placed in rows over the furnace or fireplace, the lower ends of such tubes being connected to horizontal tubes or pipes, and the upper ends with other and similar horizontal tubes. The supply of water is pumped into one of the lower horizontal pipes or tubes, and they being all connected, the water will stand at the same level in all the rising tubes or pipes; the upper horizontal tubes or pipes constitute the steam spaces.

BLAIR, JOHN, of Irvine, Ayr, gentleman. *Certain improvements in beds or couches and other articles of furniture.* Patent dated March 8, 1854. (No. 560.)

This invention comprises—1. A mode of jointing the central legs of the side pieces of portable metallic bed frames to the vertical flanges of the frame pieces, in which flanges are the joints which connect the halves of the frame-pieces together, whilst the legs are also jointed together, either at their extremities or at an intermediate point in their length, so that on folding or unfolding the frame-pieces the legs adjust themselves to their proper position. 2. A mode of turning in the end of the vertical flange of the side or end-pieces of portable bed-frames, for the purpose of attaching thereto a dovetail wedge or other joint-piece, to form the joint between the two frame-pieces at right angles to each other. 3. A mode of connecting each of the end cross-pieces of portable bed-frames to one of the longitudinal side-pieces, by a rule joint in the top or horizontal flanges of the frames. And 4. The application and use in the manufacture of mattresses and bedding of felted or milled woollen fabrics, such as "kersey," or printers' felted cloth.

SMITH, JAMES, of Liverpool, Lancaster, biscuit baker. *Improvements in baking-ovens.* Patent dated March 9, 1854. (No. 562.)

These improvements consist—1. In the direct application of heat to ovens having travelling bottoms. 2. In a mode of heating the chambers or passage containing the vertical endless band. And 3. In cooling down the horizontal endless band forming the bottom of the oven, at the point where it receives the articles to be baked.

SELBY, GEORGE THOMAS, of Smethwick, Warwick, gentleman. *Improvements in machinery for the manufacture of tubes and pipes, and for shaping tubular and circular metal articles.* Patent dated March 9, 1854. (No. 563.)

The patentee claims the construction of machinery for the manufacture or shaping of tubes, pipes, and circular metallic articles, by means of rollers mounted, and applying a rolling pressure thereto whilst they are forced through between such rollers.

JOHNSON, WILLIAM BECKETT, of Manchester, Lancaster, engineer. *Improvements in strengthening the ends of tubes to be attached to boiler plates, or to be used for other such purposes.* Patent dated March 9, 1854. (No. 565.)

The patentee proposes to produce a thickened end or ends to tubes, whereby they may with greater security be attached to boiler plates or other apparatus. To effect this he takes a tube, manufactured by any ordinary method, and compresses it at the end or ends, so as to force a certain length into a smaller longitudinal space, the consequence of which will be the desired increase of thickness. This result may be obtained by various mechanical arrangements.

YOUNG, WILLIAM, of Queen-street, Cheapside, London. *Improvements in lamps.* Patent dated March 9, 1854. (No. 567.)

The objects of the improvements are to obtain a horizontal ring of flame, and a flame bent out from a cylindrical form into a more spread flame. In making a horizontal or nearly horizontal flame, the air is supplied through the interior of the burner, and also above and below the two parallel planes of flame, which, if not interfered with, would be cylindrical, but by means of the streams of air the flames will be deflected, and be kept in horizontal or nearly horizontal planes. The two planes of flame are thus formed between two parallel discs of glass or other suitable surfaces. When it is desired to bend out the flame largely at its upper part without bringing it to a horizontal plane, there is an inner deflector used, which coming down towards the base of the flame, causes streams of air to descend into the interior of the flame, by which it is deflected outwards.

SWAN, JOHN HOLLEY, of Glasgow, Lanark, commission agent. *Improvements in the tuyeres of blast and other furnaces and*

Patent dated March 9, 1854. (No

se improvements relate to tuyeres in a constant flow of cold water is kept In place of the water being closed the tuyere, the space or spaces for ing the water is open, thereby keeping yere cool, but at the same time per- g a free escape of the water, so that event of the tuyere being burnt gh by the heat of the furnace, the is not necessarily forced into the e or fire.

ACE, WILLIAM, of Haigh, near Wigan, g engineer. *Improvements in machinery asuring, indicating, and registering the f air, gas, and other liquids, and for go g the speed of steam and other engines.* t dated March 10, 1854. (No. 573.)

s invention consists—1. In causing s, or other liquids to impinge against y suspended from a balanced beam cted to an index. 2. In registering ow of liquids by means of a marker, ich a varying motion corresponding flow of the liquid to be registered is by the balanced beam above referred e said marker being held in contact paper or other surface, to which mo- s given by clock work. 3. In govern- e speed of steam or other engines, by of a lever connected to the balanced above referred to, and to the valve or agent through which the steam or fluid passes to the engine.

SELY, SIMEON, of Hull, York, sur- dentist. *Improvements in the manufac- f artificial palates for the adaptation of ial teeth.* Patent dated March 10, (No. 574.)

is invention consists in forming arti- palates with a series of small indenta- of different depths, those which are at iddle of the palate being formed con- bly deeper than the surrounding ones, ject of which is to increase the surface e air-cells produced by such indenta- and at the same time to distribute the are over the entire surface of the roof mouth.

NTAINEMOREAU, PETER ARMAND LE- E DE, of South-street, Finsbury, Lon- *Improvements in the manufacture of es.* (A communication.) Patent dated h 10, 1854. (No. 576.)

is invention consists in the combina- f rectified oil of turpentine and potato- with tallow, employed in the manufac- of candles.

LL, WILLIAM, of Hunter's-lane, Bir- ham. *Improvements in inkstands or ink- rs.* Patent dated March 10, 1854. 580.)

e patentee makes the dipping-cups of inkstands and inkholders wholly or in part flexible and elastic, with openings or per- forations, through which the ink from the vessel passes into them, the passages or openings having a tendency to close by reason of the elasticity, and the ink only flowing into the dipping-cups so long as the passages are kept open by the use of pens or other instruments. For the purpose of supplying air to the interior of the ink- vessels to replace the outgoing ink, the patentee makes air-passages in the vessels, which may at all times be open where the dipping-cups are provided with means of shutting off the supply of ink to them. The dipping-cups are, by preference, arranged below the inner bottom surface of the ink- vessels.

NEWTON, ALFRED VINCENT, of Chan- cery-lane, Middlesex, mechanical draughts- man. *Improvements in the mode of purifying coal-gas, and of obtaining, during the manu- facture of the gas, a certain purifying mate- rial, and in apparatus to be used in purifying gas.* (A communication.) Patent dated March 10, 1854. (No. 582.)

These improvements consist in purifying coal-gas from its carbonic acid and sulphu- retted hydrogen, by means of caustic am- monia, added to it in sufficient quantity for the saturation of those gaseous impurities, and in subsequently washing out the result- ing salts with water; also in purifying coal- gas from its carbonic acid, by means of caustic ammonia, conjoined with the sub- sequent removal of its free sulphuretted hydrogen by solution of sulphurous acid, and with the use of water for removing the soluble impurities.

LEFEVRE, DÉSIRÉ PARFAIT, of Paris, France. *An improved railway-brake.* Pa- tent dated March 10, 1854. (No. 583.)

This invention consists in applying brakes simultaneously to all or most of the car- riages of a train, and in stopping or braking the engine and tender in front of the train by the usual means, the brakes of each car- riage being forced up against the wheels by the impact and pressure of the front buffers of each carriage against the buffers of the following carriage. To make this impact more efficient for the purpose of breaking, the front draw-spring is thrown out of gear with the under frame of the carriage, so that the buffer-rods, which are most gene- rally acted upon by the ends of the draw- spring, are thus set free to be pushed back, and to push back the spring.

BOITTEUX, ZEPHIRIN, of Epinal, France. *Certain improvements in the machinery for sculpturing and carving.* Patent dated March 10, 1854. (No. 584.)

These improvements consist of a new ma- chine or apparatus, in which is obtained, in

a self-acting way, the resultant of the three motions in space which a tool must in general be possessed of in order to cut out figures in relief.

PATTERSON, JOHN, of Beverley, York, engineer. *Improvements in machines for washing cloth and similar materials.* Patent dated March 10, 1854. (No. 586.)

The machine or apparatus which the patentee employs for this purpose consists of a cage, box, or chamber, the top and bottom of which are perforated or grated, in such manner that each aperture in the top is directly over a closed or solid space in the bottom, every opening in one diaphragm or side being directly opposite to a solid part in the other. The articles to be washed are deposited in this cage or box, and the cage so charged is suspended inside a tub or cistern containing water, and closed by a cover or lid, held down by a cross-bar. To the inside of both the top and bottom of the water cistern are fitted a number of projecting pieces, corresponding to the openings in the top and bottom of the cage; and as the latter is made to traverse vertically up and down by any convenient mechanical arrangement, considerable frictional pressure is alternately exerted upon the upper and lower sides of the articles under treatment, whereby they are effectually washed and cleansed.

WRIGHT, JAMES, of Manchester, Lancaster, merchant. *Improvements in machinery or apparatus for "curing" and "liquoring" sugar by centrifugal force, without acidifying or injuring the syrup.* (A communication.) Patent dated March 11, 1854. (No. 591.)

*Claims.*—1. The combination of an outer jacket and interior drainer in such manner that both may partake of the rotary movement, and the one revolve with the other. 2. A mode of exhausting the air, as well as discharging the contents of the machine through the bottom.

ASTON, JAMES JONES, of the Middle Temple, London, and of Preston, Lancaster, barrister-at-law. *Improvements in envelopes.* Patent dated March 11, 1854. (No. 594.)

This invention relates to the construction of an envelope with a tongue attached to one of its flaps, and with holes or slits through the other three flaps, so formed that the tongue may pass through them.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in lighting.* (A communication.) Patent dated March 11, 1854. (No. 595.)

This invention relates to the use of gas, the essential features of it being the heating the gas prior to actual combustion, the supplying the luminous flame with heated air, and the consuming the smoke and the general products of the gaseous combustion. The gas and heated air are supplied to the burner, which is of the common Argand kind, by two separate and distinct pipes, the air being passed through a wire gauge diaphragm, or through a suitable perforated medium, at the bottom of the burner, which is surrounded by an external tube or casing, forming an annular chamber, for the passage through of the heated air supply. The smoke and escape vapours are consumed in a chamber disposed immediately over the mouth of the chimney, and the heated air from the flame passes through an opening in the upper portion of this chamber into the hot-air supply-pipe.

BUCHANAN, JOHN, of Leamington Priors, Warwick, gentleman. *Improvements in the propellers and apparatus used for propelling vessels.* Patent dated March 11, 1854. (No. 597.)

This invention consists in arranging a series of propelling-blades or surfaces in pairs, in such manner that the two blades or surfaces constituting a pair are fixed one above and the other below the axis, and revolve in the same plane, succeeding pairs of blades being fixed one in advance of the other, so that when at rest they will all be vertical, or nearly so; and it is preferred by the inventor that the blades should not exceed in width the diameter of the boss to which they are applied. In order to prevent cordage, sails, and other matters winding round the boss of the propellers, Mr. Buchanan causes each pair of the propeller-blades to work through an adjustable frame in such manner that "the bars of which the frames consist shall come near to the forward edge of each propeller, and act as, or become one with, the forward edges of the propellers pairs of cutting edges," which will sever cordage or other matters coming between them. And in order to accommodate propellers for different depths of immersion of the ships to which they are applied, he employs in each ship two shafts, one below the other, in such manner that the engines will give motion to either, and arranges the propellers and frames so that they may be raised or lowered into correct positions, when the propeller-blades or surfaces are to be driven by either of the shafts.

WHITAKER, LAURENCE, of Haslingden, Lancaster, cotton-spinner, JOHN DIGGLE, of the same place, manager, and GEORGE HOWARTH, of the same place, overlooker. *Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.* (Patent dated March 13, 1854. (No. 598.)

These improvements consist in the employment of a small "scavening apparatus," which traverses longitudinally from one end

of the roller-beam to the other, for the purpose of collecting any waste "flyings" or loose filaments of cotton, or other fibrous substance that may fall from the drawing-rollers during the process of spinning, and also of removing or taking up all waste that may accumulate on the top of the mule-carriage; the traversing "scavenger or cleaner" may be supported or guided by various arrangements of wires or rods, or by a tenon, on the back of the "scavenger," working in a groove cut on the roller-beam, or any other similar apparatus obtaining the same end. The scavenger may be made of any suitable material, and the strictly clearing parts of flannel, fustian, or other such material, or a brush, may be employed instead thereof.

LATCHFORD, BENJAMIN, of St. Martin's-lane, Middlesex, lorriner. *Improvements in saddlery or harness.* Patent dated March 13, 1854. (No. 600.)

The object of this invention is—1. To secure a more perfect means of feeding a horse when actually employed or otherwise. 2. To prevent the serious consequences to life or limb consequent upon the stirrup-iron catching or retaining the foot of a fallen rider when, from any cause, he may fall from his horse.

HAEFFELY, EDWARD, of Radcliffe, Lancaster, chemist. *Improvements in the manufacture of stannates of soda, potash, and ammonia.* Patent dated March 13, 1854. (No. 603.)

This invention consists in the production of stannates of soda, potash, and ammonia, by forming stannic acid by the oxidation of metallic tin in an alkaline solution by the agency of an oxide of lead or any other oxide having a less affinity for oxygen than tin.

HOPPER, GEORGE, of Houghton-le-Spring Iron-works, Durham, engineer. *Improvements in pins for railway chairs.* Patent dated March 13, 1854. (No. 606.)

*Claims.*—1. "The application and use of twisted railway chair pins, which are so constructed that the upper or non-twisted portion of such pins shall be round or circular, in transverse section, whilst the twisted or screwed portion of the pin is rectangular or polygonal." 2. A mode of constructing pins for railway chairs, with cylindrical or conical necks, whilst the main body of the pins is twisted or angular in transverse section.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CHANT, GEORGE, of Stoke-sub-Hamdon, Somerset, glove-maker. *A fan-parasol or sun-shade.* Application dated March 7, 1854. (No. 546.)

This fan-parasol or sun-shade is constructed with a framework of rods or arms, so arranged that by means of levers, slides, springs, or other contrivances, the shade may be spread or opened, or may be collapsed or closed at pleasure.

EDINGTON, JAMES CHARLES, of Leicester-square, Middlesex. *Working machinery, propelling vessels, and firing guns.* Application dated March 8, 1854. (No. 549.)

The inventor employs a cylinder fitted with a piston, and charged with a mixture of carburetted hydrogen gas and atmospheric air, and by a light being applied by means of a small valve at the bottom of the cylinder, explodes the gas, so as to raise the piston by its expansive power. Then, by opening a valve at the bottom of the cylinder, the piston will descend. For guns, a chamber is to be made for the mixture, which is to discharge by means of a light, so as to project the bullet or other missile with which the gun is charged.

BRUNTON, JOHN DICKINSON, of Truro, Cornwall, engineer. *Improvements in wind-guards or chimney tops, for promoting ventilation in fire-place flues.* Application dated March 8, 1854. (No. 552.)

The inventor proposes to surround the top of the flue, or the top of a pipe placed thereon, with a broad bevelled rim, going round the entire circumference, from whence the smoke or air escapes, and to affix at short distances from each other a series of vertical vanes, wings, or partitions, so as to divide the bevelled surface into a number of channels, to collect and direct the atmospheric air passing over the chimney-tops by natural external currents.

BARNETCHE, LOUIS JEAN, of Bordeaux, France, M.D. *Improvements applicable to the prevention of accidents on railways.* Application dated March 8, 1854. (No. 554.)

This invention relates to novel modes of constructing and arranging apparatus for the purpose of preventing various kinds of accidents on railways. Thus the inventor in one case proposes to make the tender detachable from the engine; and in other cases he applies breaks of different kinds to all the wheels simultaneously.

DEVINCENZI, GIUSEPPE, of Grosvenor-street, Middlesex, gentleman. *An improvement in producing ornamented and figured surfaces, and surfaces for printing from.* Application dated March 8, 1854. (No. 556.)

This invention consists in producing figured and ornamented surfaces, by compressing natural and manufactured objects between sheets of metal, which are softened so as to enable them to receive the impression, and hardened subsequently.

AITKEN, JOHN, of Longsight, near Manchester, Lancaster, gentleman. *Improve-*

*ments in obtaining motive power.* Application dated March 8, 1854. (No. 557.)

This invention consists in an arrangement of apparatus for obtaining power by lifting and lowering weights by means of two pulleys, between which are guides for the weights used. The lowest of the two pulleys is so formed as to push the weights in succession up the guide to the upper pulley, over which it passes and descends by the guide on the opposite side.

BROWN, JOSEPH, of Leadenhall-street, London, upholsterer and cabinet-maker. *An improved method of swinging furniture and other articles for travelling by sea or land, and other purposes.* Application dated March 8, 1854. (No. 559.)

This invention consists in swinging tables and other articles of furniture on centres, on the ball-and-socket principle, with weights to keep the articles horizontal, and springs to restrain their oscillation.

GOOD, WILLIAM WALTER, of Moorgate-street, London, gentleman. *Improvements in machines applicable for thrashing and winnowing.* Application dated March 9, 1854. (No. 561.)

These improvements consist in arrangements for self-feeding, and for facilitating and rendering more efficacious the thrashing and winnowing processes.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for finishing fabrics.* (A communication from Désire Prosper Pepin and Adolphe Roy.) Application dated March 9, 1854. (No. 564.)

This invention consists in the application to finishing machines of beams carrying the cloth or fabric, having a vibratory or reciprocatory motion in the direction of their length, for the purpose of avoiding the production of irregularities in the fabric.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury. *An improved reaping machine.* (A communication.) Application dated March 9, 1854. (No. 566.)

This machine is constructed with holders for retaining the grain to be cut, and a blade or cutting-knife put in motion by the wheels on which the machine is supported.

GARNIER, FRANCOIS EUGENE SULPICE, of Paris, France. *Improvements in machinery for preparing flax and other textile materials.* Application dated March 9, 1854. (No. 569.)

This invention comprehends, — 1. A crushing apparatus, which consists of a fixed and moveable grooved or serrated jaw, hinged together, and in connection with which is a system of bruising blades. 2. A breaking machine consisting of two concentric discs set at proper distances apart, and carrying each a set of blades fixed perpendicularly to the discs, and tangentially to the circles described by them. 3. A scutching machine, which consists of two beaters, one after the other, driven in opposite directions, so as to act successively on both sides of the material. 4. A modification of the before-named scutcher, in which the scutching is effected by two curvilinear bars, having opposite transversal reciprocating motions. 5. A rotary beater, which consists of two or more sectional discs keyed on a common shaft, and carrying two rows of metallic blades, the first of which is fixed along a straight line eccentric with the radius, and the second on a sector of the periphery. 6. A modification of the foregoing, in which the blades of the beaters differ alternately in form. 7. A motion for actuating the plaiting pieces, consisting of a system of eccentrics, bell-crank, and other levers; and,—8. An improved hinged holder.

LAMY, HIPPOLYTE, of Paris, France. *Certain improvements in preserving animal and vegetable substances.* Application dated March 9, 1854. (No. 570.)

This invention consists in the introduction of sulphurous gas into the vessel containing the substance to be preserved. If an acid taste is produced by this process, it can be easily removed by the use of solution of baryta or bicarbonate of magnesia.

DESROUSSEAUX, EMILE ALFRED, of Roubaix, France, architect. *Improvements in looms for weaving.* Application dated March 10, 1854. (No. 572.)

This invention consists,—1. In the employment of revolving cylinders or barrels with moveable projections or teeth, which act on the lifting wires, and consequently on the treadles, and warp threads in a similar manner to the Jacquard machine; and,—2. In an arrangement for opening a wider shed for throwing in the weft, by means of a moveable perforated board, through the perforations of which the treadles pass, the whole being arranged in such manner as to produce the descending of the lower set of warp threads.

LAWRENCE, JAMES, of Leeds, York. *An improved rotary engine.* Application dated March 10, 1854. (No. 575.)

This rotary engine has two cylinders or drums fixed upon one shaft; the steam is admitted alternately to each of them, so that while the full pressure is being exerted in one drum the steam in the other drum is cut off, and *vice versâ*, so as to allow a diaphragm to rise and let a partition on the drum pass it, thereby keeping constant pressure exerted upon the shaft.

BUCHANAN, JOHN, of Leamington Priors, Warwick, gentleman. *An improvement in*

*communicating motion to or from the ordinary crank or an eccentric.* Application dated March 10, 1854. (No. 577.)

The connection between the piston-rod and the crank is effected by means of a cross head affixed to the rod, and having a slot or longitudinal aperture in it, equal to the throw of the crank, in which the said crank rotates and slides during the revolution of the shaft.

DAY, WILLIAM, of Beverley, York. *Improvements in the construction of covered carts and other like vehicles, which may be used as dwelling places or travelling houses.* Application dated March 10, 1854. (No. 578.)

This invention consists of the use of packing cases for the construction of the body part of covered carts or carriages, the cases being used to form the sides and ends, and the lids, the roofs, floors or other parts thereof.

WHITEHEAD, FRANCIS, draughtsman, and WILLIAM WHITEHEAD, mechanician, of Crayford, Kent. *Improvements in raising, forcing, and supplying water and other liquids.* Application dated March 10, 1854. (No. 579.)

This invention consists in raising, forcing, and supplying water by means of steam, either applied directly on the surface of the water, or applied to a cylinder, the piston of which acts on the surface of the water, the steam being generated in a separate vessel.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the manufacture of raised printing surfaces.* (A communication.) Application dated March 10, 1854. (No. 581.)

According to this invention the figures required are cut out in whole or in sections from thin sheets of prepared felt, or they are formed of wood or other suitable substance, of the thickness of the intended or required relief, and they are then secured by glue cement, or other suitable means, to the face of the printing-block or cylinder.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of hollow jewellery.* (A communication.) Application dated March 10, 1854. (No. 587.)

By this process the articles (whether composed of gold, silver, silver-gilt, or copper-gilt), are formed on a mandril of iron, which is afterwards dissolved out by diluted sulphuric acid, leaving merely the shell of the article intact, which may be composed.

HALL, JAMES COOPER, of Monkwearmouth, Durham, shipowner. *An improved windlass.* Application dated March 11, 1854. (No. 588.)

This invention consists in adding to the barrel of the windlass certain apparatus for preventing the cable from riding and from working to one end of the barrel, and to reduce its jerking and irregular action in raising weights.

MAYNARD, JOHN, of Drury-lane, Middlesex, music-wire drawer. *An improvement in strings for pianofortes and other stringed musical instruments.* Application dated March 11, 1854. (No. 589.)

This invention consists in wrapping round steel-wire a wire drawn from "Union metal," and in employing strings formed thus, for the bass notes of pianofortes, harps, and other stringed musical instruments.

MONZANI, WILLOUGHBY THEOBALD, of St. James's-terrace, Bermondsey, Surrey, gentleman. *Improvements in bedsteads and packing-cases or boxes to contain the same and other articles.* Application dated March 11, 1854. (No. 590.)

The chief object of this invention is so to arrange the parts that a bedstead shall be partly constructed of the box or case which, when it is packed and out of use, contains it.

TYTHERLEIGH, WILLIAM, of Birmingham, Warwick, hollow-ware manufacturer. *Improvements in the manufacture of tea-kettles.* Application dated March 11, 1854. (No. 592.)

This invention relates—1. To making the bodies of tea-kettles by stamping them from sheet-iron or other metal. And 2. To the application of cast spouts to the bodies of tea-kettles so made.

SYMINGTON, WILLIAM, of Gracechurch-street, London. *Improvements in apparatus for heating air by means of steam.* Application dated March 11, 1854. (No. 593.)

This apparatus consists of two hollow chambers, formed by preference of cast-iron, each chamber being made of two parts bolted and screwed together. These chambers are connected together by numerous tubes (by preference of welded iron tubing), so that when steam is admitted into one of the hollow chambers it will pervade the whole apparatus, and offer very extensive heating surfaces.

SPARROW, JAMES, jun., of Tettenhall-road, Wolverhampton, Stafford. *Improvements in shears for cutting iron or other metals.* Application dated March 11, 1854. (No. 596.)

These improvements consist in the employment of sliding wedges, for the purpose of actuating by their forward movement either the upper or lower blade or cutter of the shears, the wedges being worked by any known means.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *An elastic breeching apparatus for canons.* (A com-

munication.) Application dated March 13, 1854. (No. 599.)

This invention consists in attaching cannons to ships or forts by means of a strong elastic spring in connection with the breeching-ropes.

GLENNY, JOHN, of the Strand, Middlesex, outfitter. *A portable camp-bed.* Application dated March 13, 1854. (No. 601.)

This invention "consists in the adaptation of known materials to the purpose of forming a bed which shall effectually exclude damp or moist exhalations arising from the earth or atmosphere, and at the same time be rendered extremely portable and convenient of transit."

HAEFFELY, EDWARD, of Radcliffe, Lancaster, chemist. *An improved mordaunt, to be used in printing and dyeing textile materials and fabrics, applicable also to the process of bleaching.* Application dated March 13, 1854. (No. 602.)

This invention "consists in the use of tungstate of soda, of potash, or of ammonia, to be substituted for stannate of soda, or other mordaunts, or to be used in combination therewith."

WRIGHT, JAMES, of Park-street, Kennington, Surrey, oven-builder. *Improvements in the construction of furnaces for the purpose of consuming more effectually than heretofore the smoke contained therein.* Application dated Mareh 13, 1854. (No. 604.)

This invention consists in the use "of two sets of fire-bars, arranged and disposed in the furnace at different heights, and in forming the back part of the ash-pit, inclined or sloping upwards towards the bridge of the furnace, near which part the furnace-bars are placed higher than those at the mouth thereof, for the purpose of bringing the surface of the fire, when placed thereon, nearer to the crown of the surface."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in sewing-machines.* (A communication.) Application dated March 13, 1854. (No. 607.)

This invention consists in the employment of a number of hooked-needles, similar to crochet-hooks, which are fitted side by side in a sliding needle-carrier, and at distances apart, to correspond with the length of stitch to be made.

BELLFORD, AUGUSTE EDOUARD LORADOUX, and PERSIUS RISTORI, of Castle-street, London. *Improvements in inflating life-belts, buoys, and articles of a similar nature.* (A communication.) Application dated March 13, 1854. (No. 608.)

This invention consists in certain means of evolving carbonic or any other gas in the belt or buoy which it is desired to inflate.

## PROVISIONAL PROTECTIONS.

*Dated August* 31, 1854.

1909. George Eden, of Norwood, Surrey. Improvements in cooking-utensils.

*Dated September* 6, 1854.

1945. James Eden, of Lytham, Lancaster, bleacher. Improvements in apparatus for drying fabrics.

*Dated September* 7, 1854.

1949. Edmund Calvert, of Walton-le-Dale, Lancaster, spinner and manufacturer, and William Mitchell, of the same place, overlooker. Certain improvements in looms for weaving.

1951. Paul Adolphe Garnaud, of Paris, France. Improvements in certain gazogene apparatus used for the production of aerated liquids.

1953. Henry Lund, of the Temple, Esq. Improvements in propelling and steering vessels, and in the steam engine applied to these purposes.

*Dated September* 8, 1854.

1955. John Thornborrow Manifold and Charles Spencer Lowndes, of Liverpool, Lancaster, engineers. Improvements in windlass fittings.

1957. John Youil, of Burton-upon-Trent, Stafford, common brewer. Improvements in the mode or method of fermenting liquors, and in the machinery or apparatus employed therein.

1963. William Prior Sharp and William Weild, of Manchester, Lancaster, machinists. Improvements in the production of raw and thrown silk, and in machinery and apparatus to be used for the purpose.

1965. James Atherton of Preston, Lancaster, machine-maker, John Kinlock, of the same place, manager, and John Swainson, junior, of the same place, worsted manufacturer. Improvements in machinery or apparatus for sizeing or dressing yarns or threads.

1969. Henry Robert Ramsbotham, of Bradford, York, worsted spinner, and William Brown, of the same place, mechanic. Improvements in preparing to be spun cotton, wool, hair, tow, and other fibrous materials.

*Dated September* 9, 1854.

1971. John Wesley Hackworth, of Priestgate Engine Works, Darlington, Durham, engineer. Improvements in steam engines, and in gearing connected therewith.

1973. Thomas Hodson, of Manchester, Lancaster, overlooker. Certain improvements in machinery or apparatus for doubling yarn or thread.

*Dated September* 11, 1854.

1975. Peter Rothwell Jackson, of Salford, Lancaster, engineer. Improvements in the manufacture of wheels.

1977. Edward Palmer, of Southampton. Improvements in propelling vessels.

1979. James Worrall, junior, of Salford, Lancaster, dyer and finisher. Improvements in the method of treating and printing such fustian goods or fabrics as are called "cords" and "thicksets," or "velveteens."

1981. John Chillcott Purnelle, of Tachbrook-street, Pimlico, Middlesex. Improvements in obtaining and applying motive power.

*Dated September* 12, 1854.

1983. Edward Gillman, of Twickenham, Middlesex, gentleman. Obtaining filaments from certain vegetable substances, and applying the same to various manufacturing purposes.

1985. Charles Wentworth Forbes, of Bartley, Hants, gentleman. An improved rest for fire arms.

1987. Joseph Williams, of Liverpool, Lancaster, engineer. Improvements in propellers.

*Dated September* 14, 1854.

1996. Charles Frederick Stansbury, of Cornhill, London. Improved machinery for making screws. A communication.

1998. Charles Frederick Stansbury, of Cornhill, London. Improvements in punches and dies. A communication.

2000. Robert Adams, of King William-street, London. Improvements in machinery for boring and rifling the barrels of fire-arms.

2002. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots and shoes or other coverings for the feet.

2004. Robert Rawlinson, of Westminster, civil engineer. Improvements in valves or adjustable thoroughfares.

*Dated September* 15, 1854.

2006. Felix Fontenau, of Paris, France, gentleman. An improved mode of preventing mud from touching or adhering to carriages.

2008. Andrew Barclay, of Kilmarnock, Ayr, engineer. Improvements in refracting and reflecting telescopes.

*Dated September* 16, 1854.

2010. Joseph Harrison, machinist, John Oddie and John Eaves, mechanics, and Henry Graham, power-loom manager, all of Blackburn, Lancaster. Improvements applicable to machines for warping, sizeing, or otherwise preparing yarns or threads for weaving.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 3rd,* 1854.)

1102. William Coulson. Improvements in machinery for mortising and tenoning.

1115. Charles Barlow. Improvements in the manufacture of metallic capsules for covering or securing bottles and other vessels. A communication.

1169. John Packham. Improvements in boilers used for heating and circulating water.

1177. James Lord. Improvements in the manufacture of articles of ladies' under clothing.

1199. Leopold Wertheimber. Improvements in apparatus for preventing sea-sickness.

1204. John Kent. Improvements in harbour or river boats and other floating vessels, also in paddle-box boats.

1271. Jean Baptiste Numa Erard. Improvements in the preparation of paint.

1281. John Braithwaite. An improved method of roofing or covering buildings, reservoirs, and other spaces requiring roofs or coverings.

1332. Joseph Valentin Weber. Improvements applicable to chronometers and other mechanism requiring a steady spring power.

1340. William Brunton. Certain improvements in metallic pistons.

1395. Richard Archibald Brooman. A new or improved projectile for ordnance and small arms, and a sabot or plug to be employed therewith, which sabot or plug may also be used with other projectiles. A communication from W. Antrobus Holwell, of Quebec.

1558. Thomas Wright. Improvements in the permanent way of railways.

1561. William Hunt. Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.

1594. Joseph Barnes. Certain improvements in furnaces or fireplaces.

1648. Pierre Victor Delaye. Improvements in printing-blocks.

1659. Henry Wickens. Improvements in the means of giving signals on railways, and for other purposes.

1773. Henry Smith. Improvements in the manufacture of wrought-iron wheels.

1817. Edward Lund. Improvements in cocks, valves, water-plugs, and flexible joints.

1853. Matthew Curtis, William Henry Rhodes, and John Wain. Improvements in certain machines for spinning and doubling cotton and other fibrous substances.

1937. William Brownfoot. A new or improved instrument or apparatus for raising, lowering, and adjusting Venetian blinds.

1940. Samuel Stocker. Certain coverings for various parts of the human body, with a view to the preservation of health.

1943. Isaac Pim Trimble. Improvements in regulating the temperature in conservatories and other apartments, or in ventilating the same.

1945. James Eden. Improvements in apparatus for drying fabrics.

1948. William Newbould. Improvements in the manufacture of busks for stays.

1969. Henry Robert Ramsbotham. Improvements in preparing to be spun wool, cotton, hair, tow, and other fibrous materials.

1971. John Wesley Hackworth. Improvements in steam engines, and in gearing connected therewith.

1994. Henry Crosley. Improvements in the manufacture of paper, millboard, and felt, from materials not hitherto so used.

2004. Robert Rawlinson. Improvements in valves or adjustable thoroughfares.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed September* 29, 1854.

773. Henry Young Darracott Scott.
1021. Charles Cammell.

*Sealed October* 3, 1854.

758 James Forsyth.
794. Auguste Edouard Loradoux Bellford.
834. Henry Gilbee.
1248. Edward Maniere.
1260. William Edward Newton.
1412. Andrew Smith.
1602. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*M. H.*—Your question is one we cannot undertake to answer. We should advise your applying to an analytical chemist.

*A Mechanic's* reply to "Y.," and several other communications which have been received, will be inserted, if possible, in the next number.

## LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| Sept 1 | 3632 | J. Holmes and W. Peplow | Manchester | Boot-gore. |
| 2 | 3633 | A. Clapshaw | City-road | Cricket-stump. |
| 7 | 3634 | A. Soyer | Great Russell-street | Stewing-pan. |
| 11 | 3635 | H. Rawson | Leicester | Water-gauge. |
| 12 | 3636 | H. M. Taylor | Birmingham | Label-damper. |
| 15 | 3637 | E. and W. Seagrove | Portsea | Naval chest. |
| ,, | 3638 | Knight and Co. | Foster-lane | Cosmorama lens. |
| 25 | 3639 | C. H. Wagner | Birmingham | Regulating-pen. |
| 26 | 3640 | Rogers and Whateley | Birmingham | Button. |
| 29 | 3641 | J. E. Smith | Wood-street | Shirt. |
| ,, | 3642 | H. Marshall | Northampton | Walking-boot. |
| 30 | 3643 | L. Cohen | Birmingham | Walking-stick. |
| Oct. 4 | 3644 | H. Rogers | Upper Thames-street | Sewer-trap |
| 5 | 3645 | H. Carson | Warminster | Wheel-roller. |

## LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| Aug. 31 | 596 | J. Classon | Dublin | Urinal. |
| Sept. 9 | 597 | H. Marshall | Northampton | Walking-boot. |
| 12 | 598 | G. Wharton | Chesterfield | Smoke-consumer. |
| 18 | 599 | J. Anstey | Coventry | Watch-dial. |
| 19 | 600 | G. I. Walker | White Lion-street | Subauriga carriage. |
| 21 | 601 | J. Victor | Wadebridge | Closet receptacle. |
| 23 | 602 | F. Palling | Lambeth | Book-edging. |
| ,, | 603 | B. Wheeler | Nottingham | Gas-stove. |
| 29 | 604 | J. Relfe | Whitechapel | Gum-vase. |
| 30 | 605 | C. Davis | Oxford-street | Railway greoved lathe. |
| Oct. 4 | 606 | J. R. Cooper | Manchester | Sketching-stool. |
| ,, | 607 | W. Williams | New North-road | Button-fastener. |

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No 1627.] SATURDAY, OCTOBER 14, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## LAUREAU'S PATENT FURNACES.

Fig. 4.

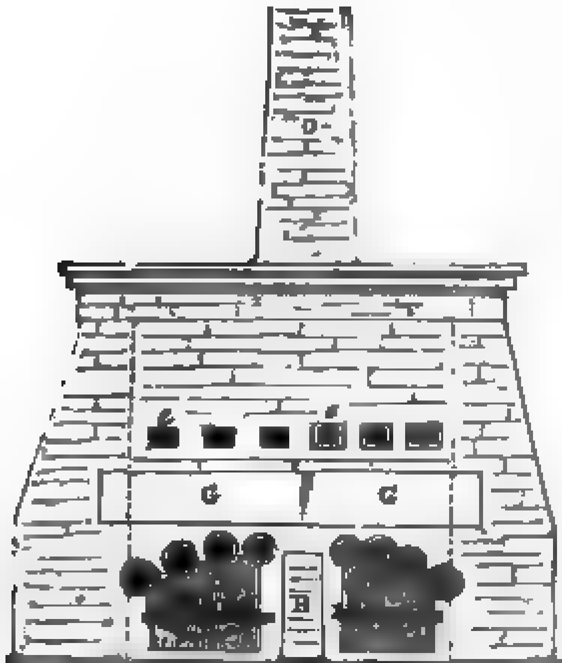


Fig. 3.

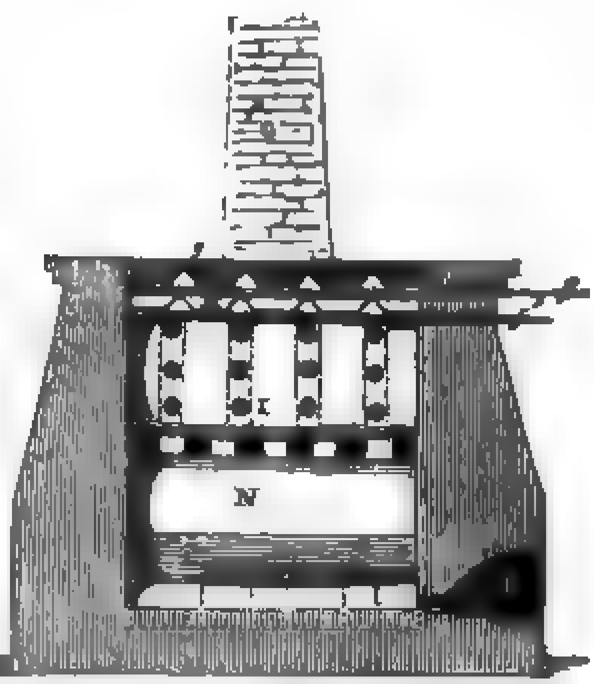
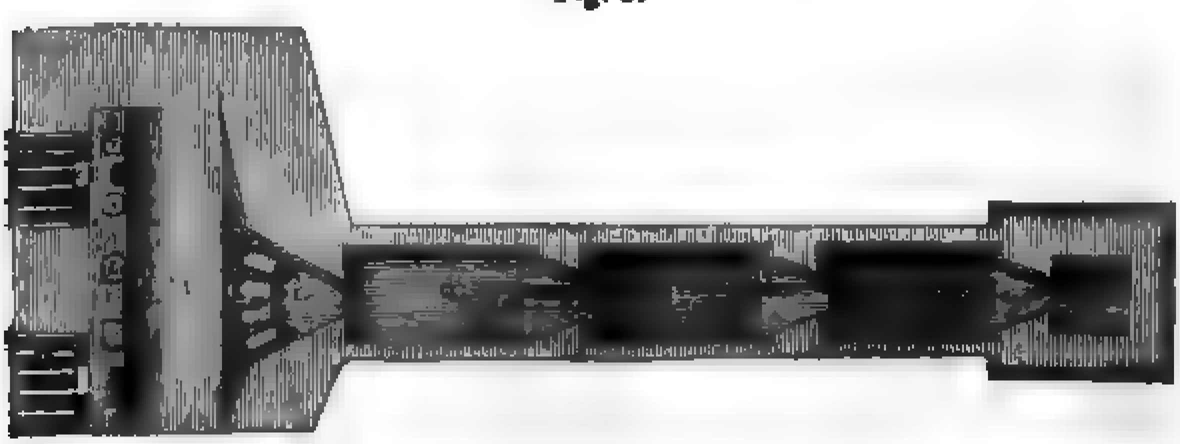


Fig. 1.

Fig. 2.



## LAUREAU'S PATENT FURNACES.

(Patent dated February 24, 1854.)

THE engravings on the preceding page represent a furnace which has recently been patented in this country by M. Laureau, of Paris. It is adapted for the smelting of iron, the melting of glass and enamel, and for a variety of other purposes.

Fig. 1 is a vertical longitudinal section; fig. 2, a horizontal section; fig. 3, a transverse vertical section; and fig. 4, an end elevation.

This furnace is intended to be made about eight feet in height; but its dimensions may be greatly varied, and it may always be made of much less height than the ordinary blast furnaces. A sufficient capacity is obtained by increasing its width and the number of fires. The furnace shown in the figures has only two fires, C, which are separated by the pier, B. These fires are covered by a series of cylinders or retorts of iron or fire-clay, D, for generating carburetted-hydrogen, or other gases, which it may be required to introduce into the furnace. The gases pass through perforations, *j*, in the backs of the retorts, and, descending, pass under the brickwork or masonry, *k*, and enter the body of the furnace, N. Each fire has two grates, E and F, placed one above the other. The upper grate consists of a series of tubes of iron or fire-clay, E, supported on a frame, *b*. Each of these tubes contains a number of small hollow cones of iron or clay, *d*, having all their apices directed towards the interior of the furnace. These tubes, E, are always kept at a high temperature by the fire resting upon them, and also by the cinders or partially consumed fuel which drops between them on to the second grate, F. Air passes through these tubes, and, becoming highly heated, meets with the products of combustion of the fire, and the gases from the retorts, D, and the intensely hot flame thus produced enters the body of the furnace, N, between the short pillars or supports, *l l*.

The second grate, F, is intended for burning the cinders or partially consumed fuel, and the smaller portions of the fuel which fall between the tubes of the upper grate. The bars of the second grate are of iron, and placed closer together than those of the upper grate. A triangular or prismatic tube, *c*, with one of its angles downwards, is placed between the two grates, and employed for conveying away the slag when the furnace is used for smelting iron. This tube, *c*, being placed between the two grates, is kept sufficiently hot to prevent the slag from solidifying in it.

All the parts of the fire places, including the supports of the grates, are capable of being removed and replaced when repairs become necessary. To facilitate this operation, and to support the upper part of the furnace, each fire-place is covered with a large block or bearer of stone at G. When the central pier, B, requires repairs, these stone bearers are supported by temporary props. One or more openings, *e*, are made in the front of the furnace for introducing gases, or other matters, if required, and also for examining the interior of the furnace when required. These openings are generally kept well closed. *ff'* are two sliding plates or registers, which slide in frames built into the upper part or throat of the furnace. These registers have apertures in them corresponding to a series of prismatic or semicircular pieces of stone or cast iron, H, fixed in the throat of the furnace, so that by drawing the registers out a little, their apertures are brought under the spaces between the pieces, H, and anything placed there is allowed to fall through. The charge of materials is thus introduced into the furnace, and by closing one register before the other is opened, the products of combustion are prevented from escaping, and the air is also prevented from entering. *g* is another plate, without apertures, which serves for covering the top of the furnace. If it be required to close the top of the furnace still more effectually, the plate, *g*, is made with a rim round its edge, which enters a groove containing water or other liquid, so as to make an hydraulic joint. The walls of the upper part of the furnace are made thinner than at the lower part, so as to prevent the upper part from becoming too hot.

The capacity of the furnace may be greatly increased by lengthening it, and increasing the number of fires, without the necessity of increasing its height; and the heat of each part of the furnace may be regulated by urging or slackening the different fires. *i* is the crucible from which the melted iron or other substance is drawn off from time to time at P. M is the brickwork or masonry forming the back of the furnace, and having several passages I, I, and K, communicating with the common passage, J. The vapours and gases in the upper part of the furnace escape by the passages, I, I, and join the torrent of flame passing through the passages, K. The united stream passes through the channels, L, into the condensing flue, Q, and thence up the chimney, O. The flue, Q, is constructed of stone or granite, and may be from fifteen to thirty feet long, or more or less. Its bottom is formed of basins of granite, each of which is furnished with an outlet passage and

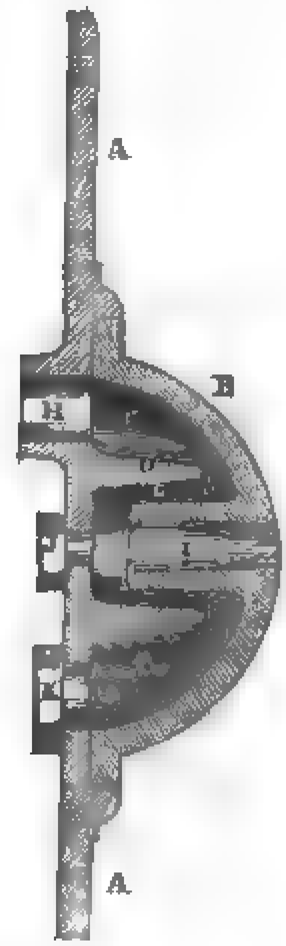
stopper. The top of the condensing flue is formed of flat stones or flags, R, pierced with holes, and having grooves or gutters formed in their surfaces. These flags are covered with sand, which is constantly supplied with water, so as to produce a continual shower in the condensing flue, Q. The condensible matters carried away by the flame, and products of combustion, are thus condensed in the flue, Q, in lieu of passing up the chimney. A furnace or fire-place may be placed at the bottom of the chimney, O, to increase the draught. The flue is made with alternate enlargements and contractions of section to check the return of the gases towards the furnace.

The inventor, in his specification, describes other furnaces constructed mainly upon similar principles, but affected with various modifications of the arrangement just described.

## JOPLING'S PATENT FURNACE TUYERE.

Mr. J. Jopling, of Bishopwearmouth, has patented an improved nozzle for the end of the tuyere or blow-pipe of a blowing apparatus, his object being to protect the same from the injurious effects produced by the action of the fire upon it. The nozzle is composed of two pieces, one being the front or face which is in contact with the fire, and through an orifice in which the air passes into the fire; the other being the back or back-plate, in which an orifice is made to receive the end of the tuyere or blow-pipe. The interior of this hollow nozzle is constructed with one or more annular chambers, the front and back-plates or pieces being furnished with the requisite number of bosses or flat rings alternately fixed upon them, the boss through which the air passes to the fire forming the inner boss or ring, the second being exterior to that, and fixed upon the back-plate, and, if the number be increased, the third fixed on the front plate, the fourth on the back plate, and so on, according to the number of chambers. The rings are made of such sizes, and so placed, that upon the two plates being put together, there shall be alternately a boss or ring fixed to the front plate, and a boss or ring fixed to the back plate, concentric, or nearly concentric, with each other, and the one within the other, and with spaces between them, so that they may form two or more annular chambers, into the outer of which the air may be blown, passing through each of them in succession until it shall finally reach the orifice in the front plate, through which it passes into the fire, as already mentioned. The front or face of the nozzle being in contact with the fire, that part of the nozzle and the annular chamber or annular chambers are heated. The air is blown through the tuyere or blow-pipe into the annular chamber or into the outer annular chamber (if there be more than one), from whence it passes through the inner chamber or chambers, and ultimately through the centre of the boss to the fire, in order to cool or diminish the heat of the nozzle, and parts connected therewith, and prevent them from being destroyed as rapidly as the end of the ordinary bellows-pipe of a forge. Two or more tuyeres may be used for blowing the air into a nozzle.

The accompanying engraving represents




a vertical section of a nozzle constructed according to Mr. Jopling's invention. A A is the back plate of the nozzle, and B B is the front or face of the same, which is secured to the back plate by bolts and nuts; D is a boss or ring formed on the back plate, A A, and E is a similar boss or ring of smaller dimensions formed on the front or face, B B. These bosses or rings, when the back plate and the front or face of the nozzle are bolted together, come one within

the other, so as to form annular chambers, F G, within the nozzle, as above mentioned. H is an aperture in the back plate communicating with the annular chamber, F, into which aperture is introduced the end of the tuyere or pipe leading from the bellows or blowing machine, by which air is supplied to the nozzle; and I is an aperture through the boss, E, by which the air passes from the nozzle to the fire of the forge or other furnace. J is an aperture in the back plate, A A, for cleaning out the air passage, I, through the boss, E: and K is a similar aperture for removing any ashes that may collect in the annular chamber, F. Both of these apertures are closed by screw plugs.

## THE MINTS OF FRANCE.

FRANCE possesses seven mints; before 1814 there were as many as eighteen, but at that period eleven were suppressed, including the following among others,—Bayonne, La Rochelle, Limoges, Nantes, Perpignan, and Toulouse. Each of the existing establishments makes use of a peculiar mark on its coinage to designate the mint in which it is struck. Thus the coins of the Paris mint bear the letter A; Rouen, B; Lyons, D; Bordeaux, K; Strasbourg, BB; Marseilles, MM; Lille, W. But of these seven, Paris is the only mint that has kept up an uninterrupted coinage of gold and silver money; and it is only since the copper coinage was re-melted that the provincial mints have evinced any activity.

It is a known fact, that the coinage in France is not undertaken by the State, but by contractors, who are styled Directors of the Manufacture, and who are subjected to a system of superintendence and registration. The State allows them for cost of coinage at the rate of a franc and a half per kilog of silver (about 2 lbs.), and six francs for the same weight of gold. The directors of the mint are required to supply one fortieth of the silver coinage in fractional parts of the five franc piece; that is to say, 25,000 francs worth out of every million of francs. It is thus distributed,—5,250 francs worth (or about 210*l.*) of 2 franc pieces; 12,250 francs worth (or 490*l.*) of franc pieces; 6,250 francs worth (or 250*l.*) of pieces of 50 centimes; and 1,280 francs worth (or 50*l.*) of pieces of 20 centimes. The tenth part of the gold coinage is to be in ten franc pieces. The cost of the copper coinage is a franc and a half (about 1*s.* 3*d.*) per 10,000 francs worth (or 400*l.*) It is difficult to form an idea of the magnitude of the arrangements of the Paris mint. The results already attained are astonishing; nor less so are those within the reach of its machinery, such as the furnaces, crucibles, rolling mills, presses, milling and cutting apparatus, &c., which are contained in a comparatively small compass. Two steam-engines of 30 horse power work the various apparatuses which prepare the strips for feeding the coining presses. Each press, attended by a single workman, strikes off 50 coins per minute, and might be made to work off 60 by slightly increasing the speed. It is calculated that if each press were to strike off 50 coins per minute during 12 hours per day for 300 days in the year, the 16 presses would produce nearly 3,500,000,000 francs (or 140,000,000*l.*) worth of 20 franc pieces; 1,700,000,000 francs (or 68,000,000*l.*) worth of 10 franc pieces; 864,000,000 francs (or 34,560,000*l.*) worth of 5 franc pieces; 639,360,000 francs (or 25,574,400*l.*) worth of pieces of 2 francs, 1 franc, 50, and 20 centimes; and above 31,000,000 (or 1,240,000*l.*) worth of pieces of 5, 2, and 1 centimes.—*Translated from Moniteur Industriel.*

## CHARCOAL RESPIRATORS.

IN a communication to the *Journal of the Society of Arts*, Dr. Stenhouse says; "As many persons object to the unsightliness of the ori-nasal charcoal respirator, I have recently got one constructed for the mouth alone. It does not differ in appearance from an ordinary respirator, but is only half its weight. The air is made to pass through a quarter of an inch of coarsely-powdered charcoal, by means of which its temperature is greatly increased. This charcoal respirator possesses several advantages over the respirators ordinarily in use. 1st. Where the breath is at all fœtid, which is usually the case in diseases of the chest, under many forms of dyspepsia, &c., the disagreeable effluvia are absorbed by the charcoal, so that comparatively pure air alone is inspired. This, I think, may occasionally exercise a beneficial influence upon diseases of the throat and lungs. 2ndly. The charcoal respirator for the mouth alone will certainly prove highly useful in poisonous atmospheres, where miasmata abound, if the simple precaution is only observed of *inspiring* the air *by the mouth, and expressing it by the nostrils.* The charcoal respirator for the mouth is much cheaper than any other effective form of the ordinary respirator, being manufactured by W. B. Roof, 8, Willow-walk, Kentish-town, for not more than 4*s.* each.

## PROCEEDINGS OF THE BRITISH ASSOCIATION.

THE demand for space at present made

by our correspondents is so great that we are compelled to postpone the publication of numerous abstracts, with which we have been furnished of papers read before this Association. Fortunately, the subjects of these papers are matters not of temporary but of permanent interest, and may, therefore, be reserved without losing their value.

## ON THE FORMATION AND COMBUSTION OF SMOKE.

*To the Editor of the Mechanics' Magazine.*

Sir,—Whether an atmosphere impregnated with smoke be salutary to the respiratory organs immediately, and beneficial to the rest of our organisms indirectly, or not—whether it be wise to endeavour to compel, by legal enactment, industrious furnaces to consume their own smoke, while lazy fireplaces are allowed to vomit forth blacks to their throat's content, or not—every Englishman must allow that it is desirable that every Act of Parliament should be obeyed so long as it is law. It is now ordained by law that the furnace-chimneys of London shall emit invisible products of combustion, and not visible black smoke. There seems to be a general inclination among the chimneys to do their duty as Englishmen; but some tall malcontents still continue to wave their black plumes in the wind, in defiance of the Home Secretary, and in rivalry with our home-made kitchen and parlour nuisances. Of course, most of these obstinate chimneys plead ignorance of the laws—not of the land—but of nature, and say they don't know how to burn their smoke; but some of them, I have heard, are wise in their own conceit, and go so far as to aver that the consumption of smoke is a thing impossible, and that there is still a law of nature, as yet unrepealed, against it.

Now, Sir, this last notion is not true. I wish you would allow me to state, for the benefit of all well-disposed chimney-flues, what is the real state of the case, and to refer them, for the very best proof of it, to ocular demonstration. I do not suppose that I have much to say that will be worth knowing to the shafts that are already smokeless; for enough for their purposes has been proved long ago. It had, often enough before the first of August last, been shown by many chimneys, theoretical as well as practical, that, by contrivances more or less complicated, smoke might be consumed, or at least prevented. I only wish to point out, to those that are not satisfied by the old demonstrations, that the smoke of boiler-furnaces of the common construction may, by a new and most simple contrivance, be perfectly consumed. And I wish to call their attention—that of the cautious and slow-going chimneys—to a fact or two about smoke, which it is probable that they, and perhaps some of their smokeless go-a-head neighbours, were not previously aware of.

The contrivance, to which I allude, is the invention of W. Woodcock, Esq., and is in excellent operation at his brewery at Earl's-court, Old Brompton. I have no doubt that any chimney, that will send its master to inspect Mr. Woodcock's furnace, will be perfectly satisfied that the most voluminous smoke may be utterly consumed with ease and comfort. The invention is the subject of letters patent obtained by the gentleman who designed it and worked it out. I may, therefore, briefly describe it, and state the principles which it embodies. I may also state that this letter is not a puff of the invention, put together for it by a retained advocate, but is written, without even a suspicion on the part of its proprietor of the intention to write it, by a person who has not the remotest interest, direct or indirect, in its success. Perhaps I ought to apologize to Mr. Woodcock for taking the liberty of thus putting his name in print; but as he is a patentee, he has made his name public property, so far as this invention is concerned. I have been prompted to write this letter solely by the gratification which I experienced in witnessing, a few days since, the beautiful operation of his furnace and smoke-consuming apparatus, which I will now describe.

The invention consists of two parts, each being the addition of a very simple piece of apparatus to the ordinary boiler-furnace. The first of these is a double set of thin iron bars lying horizontally in the direction of their length, parallel to each other, immediately beneath the grate in the ash-pit. Each set of bars resembles a Venetian blind in its arrangement; the bars being inclined at an angle of 45° to the horizon in the direction of their width. The bars of the two sets are thus inclined in opposite directions. The bars of each set are so close together that a vertical straight line cannot pass between any adjacent pair of them; yet far enough apart to allow all cinders to fall freely through, and air to pass freely upwards to the fire. The bars of both sets are of the same length with the grate, so that they underlie it from front to back completely. If I have described this design intelligibly, the reader will perceive that the effect of it must be to screen the ash-pit completely from all the heat radiated directly downwards from the grate, and to allow almost none to pass through by reflection. In fact, not a ray of heat can reach the ash-pit from the furnace, without suffering four

reflections from rough iron surfaces, which will leave a mere shadow of a ray for further progress.

The first consequence of this is, of course, that a large quantity of heat, which otherwise would be radiated out of the furnace into the ash-pit, thence reflected and re-radiated to the winds, and so lost, is here saved for the boiler. The second is, that the ash-pit is as cool, I was going to say, as a cucumber—certainly as a cucumber-bed. It is only slightly heated by the cinders which fall through; and this source of heat may be reduced to any extent by frequently removing the rubbish from the pit. The third consequence is, that the air that passes from below through the grate, not being heated in the ash-pit, enters the fire cold, and therefore not, as it does from ordinary ash-pits, in a rarefied condition. By reason of its coolness, this air cannot so readily burn the grate-bars as it enters the fire; and, by reason of its unrarefied state, it produces a more intense and rapid combustion of the fuel, after it has passed the bars.*

The second part of the contrivance is that which is more especially the smoke-burning apparatus. It is thus constructed. A tube or set of tubes,—two is a convenient number,—open at both ends, pass through the furnace horizontally from front to back, and terminate with tight joints in the walls of the two ends of the fire-place. These walls are, of course, in front, the face of the fire-place; at the back, the bridge. In front the tubes open to the air. The fire-bridge differs very importantly from this part of an ordinary furnace. In the first place, it is hollow: in the second, it is divided into two parts, one of which, the larger, stands up from below; the other, which is shallower, is in contact with the boiler which rests upon it. Between them pass all the products of combustion from the furnace. The two parts communicate with each other by channels at the sides, and thus form together an annular chamber. The tubes before mentioned enter the front wall of this chamber, and thus establish a communication between its interior and the outer air. The back wall or plate, both of the upper and of the lower part of this chamber or bridge, is perforated with numerous holes, opening thus from the interior of the bridge to the space beyond it, and so establishing a direct communication between the outer air and the throat of the flue. There is a second solid bridge beyond the first, descending from the upper side of the flue: this, by interrupting the direct channel through this part of the passage, retards the flow of the smoke and gases, and causes their perfect mixture with each other within the space between the bridges.

The result of this arrangement is, that a current of highly-heated air, which passes through the tubes in the furnace, escapes at the back of the bridge, through the perforations in its hinder wall. This hot air mixes with the gases from the furnace, which hold the smoke in suspension, and there burn it, converting the smoke into flame.

The success of this expedient in fact is as perfect, as the conception of it in theory, and the construction of it in practise, are simple. The device is, indeed so neat, that the wonder is, as is often the case with inventions whose beauty is their simplicity, that it was not invented before. The principle here embodied is the same as that which Argand introduced into the construction of lamps,—the supplying air to an imperfect flame, where it is wanted, beyond the seat of primary combustion. The method is so obvious, that, in considering the question of the consumption of the smoke of ordinary furnaces, I, and no doubt hundreds of others, had long ago concluded that this was the most direct way to effect the object. I supposed, however, that, as there is nothing new under the sun, it must have been tried long ago, and found to fail from some obstacle not discoverable without experiment on a working furnace. But it appears, however, that the thing was untried even in 1854, till the sagacity of the gentleman, whose name I have mentioned above, carried it into execution.

I believe, nevertheless, that a method somewhat similar, that of introducing cold air to the fumiferous gases behind the fire-bridge, has been tried, and has failed. I will, with your permission, explain why this latter plan would not succeed, at the same time that I attempt to refute a fallacious statement, which has been made and credited, to the effect that smoke once formed cannot be burnt.

It is necessary here to understand what smoke is. Now, notwithstanding the abundance of this valuable article in the metropolis, I do not think the chimneys have quite correctly explained to the public the nature and merits of the produce which they supply. I will, therefore, take upon myself the office of chimney, and endeavour to convey to the senses of your readers a perception of the qualities of coal-smoke.

Smoke is not a substance of constant composition: the variations of which this stuff is susceptible will be best understood by following a coal in its passage from the furnace-mouth to the chimney. When a

* As the reader will find expounded, with many other allied matters, more clearly than in any other book, in Mr. T. S. Prideaux's admirable (but miscalled "Rudimentary") "Treatise on the Economy of Fuel," published by Weale.

piece of bituminiferous* coal is thrown upon the red-hot fuel in a furnace, it immediately begins to decompose, at first on the surface, the change gradually reaching its centre. The products of this decomposition are very various. Among them, besides water, are sulphur, cyanogen, ammonia, and certain compounds of these bodies, which we may neglect, as not playing an important part in the subsequent phenomena of combustion. But the chief portion of the substance is resolved into these bodies here following:—carbon, or coke, which, during the earlier stages of the process, remains behind with the ash unburned; hydrogen, and a long series of compounds of this element with carbon, all of which escape in the form of gas or vapour from the source which evolves them. We may now also lose sight of the residual carbon, which is not further concerned directly in the production or consumption of smoke. It is in the gaseous products that we are interested. These are a most remarkable series of bodies: some of them, besides their fundamental carbon and hydrogen, contain nitrogen or oxygen, and are of such nature that they confer alkaline or acid properties on water with which they may combine. But the chief bulk of them are compounds, neutral, or devoid of salt-making appetites, of the two eminently combustible elements alone, in various proportions: we may confine our attention to these latter products. The most obvious character by which they are distinguished from each other, is their degree of volatility. This is very various for them severally, but fixed for each specially. They form a series of vaporizable bodies, ranging, from the irrepressibly expansive hydrogen—through gases which may be condensed less or more easily by cold and pressure—through substances liquid at ordinary temperatures, but boiling at heats varying, from that of a frog's heart, to that of the boiler of a high-pressure steam-engine under dozens of atmospheres—up to liquefiable solids, which require considerably higher heats than mercury does, even a red-heat, to make them boil: these latter are the compounds which constitute pitch. Generally, the less easily the hydrocarbons are volatilized, the more carbon they contain. Again,—and this is a very important point,—the less their tendency to gaseousness, the denser is their vapour at any given temperature, and the less easily are they burned:* but they are all inflammable under proper conditions.

Of the order in which these numerous hydrocarbons are evolved from the decomposing coal, or of the temperatures at which they are severally generated, next to nothing is known; nor is there much pretence of knowledge on the subject. Whether, from each molecule of fuel, they are all formed simultaneously, but given off in succession, according to their volatility—or whether each is generated and evolved separately and successively, leaving behind the residue of the molecule, from which it proceeded, as another new compound not yet containing the other final products of the distillation—we are not hitherto informed. We are, strange to say, still completely in the dark, both as to the theory and the practice of the destructive distillation of organic substances. It is probable that the latter of the hypotheses above mentioned is the true one; for gentle carnivores do not taste "picoline" in their roast beef, nor frugivores "creosote" in their toast.

For our purpose, however, we may assume that, practically, all these substances —hydrogen, marsh gas, olefiant gas; benzole, toluole, cumole, cymole; naphthaline, paranaphthaline, chrysene, pyrene, &c., constituting together the vapour of tar—are generated at once. For in our furnace, immediately after coaling, there is present fuel in all stages of decomposition, so that, from one part or other of the mass, we may be sure that representatives of the whole series are suppled. This complex tar-vapour, in fact, may often be seen in a domestic fireplace, issuing, with a yellow colour, from a freshly-heated coal.

From our coal, then, just thrown into the fire, are, after a few seconds, evolved all these compounds; they are at once mixed, as they leave their birth-place, with carbonic oxide, a gas readily inflammable with oxygen, and carbonic acid; these two compounds being the result of the union of the oxygen of the air with the incandescent carbon, the residue of the last coaling. The gaseous medley is then further mingled with a certain quantity of atmospheric air, which has entered about the door above the bed of fuel, or, having passed up through the fuel from beneath the grate, has escaped exhaustion of its oxygen. Whatever may be the quantity of oxygen thus admitted to the inflammable vapours, it is never, in any ordinary boiler-furnace, sufficient for their complete combustion, that is

* By "bituminiferous coal," I mean a coal of any of those varieties commonly called "bituminous." The proper signification of this last word is, according to the usage of our tongue, "containing bitumen." But not one of these, or of any known kinds of true coal, contains bitumen. They yield bitumen when subjected to destructive distillation. All true bitumina are soluble in hydrocarbon oils. Coal yields nothing to solution in such liquids.

* For further information about these substances, I must beg to refer any capnophilous reader to a paper on Coal-tar, which I published some years ago in the "Quarterly Journal of the Chemical Society," vol. i., p. 244, and to a pamphlet on "Benzole; its Nature and Utility."

for their conversion, by union with oxygen, into water and carbonic acid.

What then takes place? This is the question on which the whole inquiry about the burning of smoke depends. For the understanding of this it was necessary just to dip, as above, into the natural history of tar. The available oxygen immediately seizes upon the less dense, and, co-ordinately, more readily inflammable, of its vaporous neighbours, being provoked thereto by the heat which pervades the mixture. Thus, then, first the free hydrogen and the carbonic oxide are burned; then follow the marsh gas and the olefiant gas; and soon, in order, approximately, of their gaseous tension, the other hydro-carbons are consumed, or would be, if there were air enough. But since there never is sufficient oxygen, in ordinary furnaces, to satisfy the wants of all the volatile fuel, there must be a point at which the combustion begins to flag, and another at which it finally ceases.

What, then, happens when, the supply of oxygen beginning to fail, the conflagration of that portion of gaseous fuel, whose turn it is to be burned next, cannot be completed? We may assume that, usually, there is a sufficiency of air to burn, at the outset, all the free hydrogen, all the carbonic oxide, perhaps all the hydrocarbons that are permanent gases. All the residual vapours, then, that remain as claimants for inflammation, contain hydrogen and carbon combined. Further, the nature of these bodies is such, that, when exposed, without access of oxygen, to temperatures very far above their boiling points,* they decompose thus,—at the more moderate of such heats into new combinations of carbon and hydrogen, and finally, at the highest degrees into free carbon, and the simplest compounds of this with the sister element. Now the heat produced by the combustion, which we have noticed, of the hydrogen and carbonic oxide, is very intense, sufficient therefore to effect this final decomposition of a certain portion of the other less inflammable vapours. Thus, then, carbon, in the form of lamp-black,—not yet soot,—is separated among the vapour; and further portions of marsh gas and of olefiant gas, perhaps also of some other of the less volatile hydrocarbons, are formed by the splitting up of, let us say, those more volatile oil-vapours which would constitute coal-naphtha, namely, benzole, toluole, and cumole. The new supply of gases of higher tenuity, thus offered to the failing oxygen, will be seized and burnt, consuming part of the heat, they thus generate, in decomposing a further quantity of tar-vapour.

And now the point is reached at which combustion must cease for want of oxygen. What now ensues? The lamp-black carbon floats on in the current of carbonic acid and steam, mixed with the nitrogen of the air, and with the unburnt residual tar-vapours of greater density. Such is the atmosphere which leaves the fire-place soon after coaling, and passes over the bridge into the throat of the chimney,—and thence onwards to the throats of men; but, before it reaches the latter receptacles, another process takes place, which must commence in the chimney soon after the vapours have passed the fire-bridge. It will be remembered that the vapour of tar contains some substances which have very high boiling points, not below the heat of redness. These substances, being the least inflammable of the products of the distillation, will be present with the products of combustion, whenever that is imperfect. Now the evaporation of the water in the boiler is constantly reducing the temperature of every particle of vapour that passes under it; and as the temperature of the vapour falls, its tension diminishes, and at a certain stage it must be condensed to the liquid state. The condensation of the different constituents of the tar-vapour will take place in an order inverse to that of their inflammation. The least volatile will of course be liquefied first; each as soon as its temperature has fallen a little below its boiling point. As soon, therefore, as the vapour has been cooled to a point about that of dull-red iron, the vapours of the pitch begin to condense. The lamp-black particles, which are floating among them, offer points of congregation for the pitch-dew thus forming in the chimney-throat. On it they settle: and as the current, gradually cooling, passes up the chimney, the other vapours are condensed in succession, and deposited on the pitch-coated atoms of carbon. Finally, under further cooling, the condensed matter solidifies, and agglutinates the lamp-black particles; and thus is formed soot. It is probable that this process is accelerated by the remarkable power which carbon in a fine state of division, and especially when recently ignited, possesses of condensing gaseous matter upon its surface: and thus probably the liquefaction of the vapours takes place at much higher temperatures than in the absence of the lamp-black would be possible, perhaps even at heats considerably above their boiling points. The atmosphere of steam and carbonic acid, mixed with the, not yet liquefied but, condensing vapours of tar, and

* Absolutely nothing precise is yet known about the temperatures at which bodies, fixed or volatile, decompose: neither is it known what influence pressure can exert upon this change. There can be no doubt that such decompositions follow, as respects heat, laws as regular as does the ebullition of volatile liquids.

holding in suspension particles of carbon and of soot, is smoke.

The reader will not, of course, understand me to mean that the process of the formation of soot and smoke actually takes place by steps as I have described it. It must consist of insensible shadings-off of one phenomenon into another, in a manner which cannot be represented by words and sentences:—there are no printers' spaces, commas, or full stops in the chimney. But the changes which I have noted may be taken to indicate approximately the succession of transitions, which must take place in the ordinary combustion of coal, somewhat as the nature of a curve may be represented by points taken at intervals along its course.

I can now point out wherein the chief merit of Mr. Woodcock's smoke-burning invention consists. It lies in his supplying the vapours, behind his fire-bridge, with very hot air. From the failure of the plan involving the introduction of cold air into the chamber beyond the grate, and from other observations, perhaps, it seems to have been concluded by some persons that smoke cannot be burned. Now the fact is, that smoke can be burned very easily under proper conditions. One chief condition to this end is, that the temperature of the smoke and of the air presented to it shall be high enough. From the considerations above stated with respect to the generation of smoke, it will be understood that coal-smoke is not a mixture of constant quality. It will contain more or less of the more inflammable vapours, according as less or more oxygen has been supplied to the fuel. The further the burning out of the more volatile vapours has been carried at first, the less easy will it be to ignite the remainder. Practically, the smoke, that leaves the fire-place of an ordinary boiler-furnace, requires a very high temperature,—I cannot venture to specify degrees—for its inflammation. That this is the case, any person may satisfy himself by trying to ignite the jets of smoke, which issue from a roasting coal on his fireplace. When these are yellow, they contain a large proportion of the vapours of pitch, and are not very easily to be lighted with a piece of burning paper, especially when they do not set into a current of hot air. The varying inflammability of the hydrocarbons is a very interesting point in their natural history. Benzole is so volatile, and consequently inflammable, that at ordinary temperatures, a taper brought near a surface of it will cause it to burst at once into flame. Cymole is so much less inflammable, that, though a wick moistened with it will blaze instantly on the touch of a flame in the open air, yet a burning torch, dipped even slowly into a vessel of the cold oil, will be extinguished as effectually as it would be by water. Of the least volatile tar-compounds, the tendency to ignition is so feeble, that I have often held a lighted taper at the mouth of a retort from which the substances have been distilling, and, of course, some vapours escaping into the air, without anything, beyond the boundary of the taper-flame, catching fire.

It will be seen, from these facts, why cold air, thrown into the smoke-chamber of a furnace, will not consume the smoke. It cools the pitch vapour to a degree below its kindling point, perhaps aids in the condensation of it,—at any rate, cannot contribute to keep it in the vaporous state, which is a necessary condition for its ignition. But the case is very different with hot air, especially with air of the very high temperature, which is attained by the passage, which Mr. Woodcock provides for it, through the tubes lying within the combustion-chamber of his furnace. In this case, the hot oxygen and the pitch vapour meet in a state quite as favourably predisposed for combination, as do the air and alcohol vapour about the wick of a common spirit-lamp. Here, then, the smoke-chamber of the common furnace is converted into a second combustion-chamber, for the supply of which with fuel the grate-chamber serves as a retort. The tar vapours must be burned in the order of their volatility, commencing, let us say, with the last remains of the cymole vapour that escaped in the grate-chamber, and terminating with the pyrene and chrysene of the pitch. The combustion of these will serve, first to heat to incandescence, and then to burn, the particles of carbon which are floating in the vapour; and so the last particles of the smoke will be consumed.

So much for theory, for the edification of speculative chimneys having an appetite for first principles. For the benefit of practical shafts, having an eye to their own interest, let me state what I saw the other day at the Earl's-court Brewery. It was on the afternoon of Tuesday, Sept. 12, one of the days on which the proprietor has invited the public, by advertisement, to visit his premises, and witness the operation of his furnace.

The fire was burning briskly, and steam was up in the boiler. No smoke was issuing from the mouth of the chimney, which is a brick shaft, I suppose about 25 feet high. I placed myself so as to be able to see both the chimney-top and the furnace-door. The following movements were made in compliance with my request, for the purpose of testing the action of the apparatus. A good charge of coal was thrown upon the fire, and the furnace-door shut. No smoke appeared at the chimney-top, either immediately or

after the lapse of seconds or minutes. Soon after this, before the charge of coals could have been half heated through, the contents of the furnace were thoroughly stirred and raked together, and the door closed, so as to accelerate the destructive distillation of the coal, without favouring its combustion by additional access of air by the ordinary passages. A faint mist of smoke appeared at the chimney top, flowed for a minute or two, and then vanished. I then got the outer mouths of the tubes on each side of the fire-door plugged up with wet cloths, so as to stop off the supply of hot air to the chamber behind the bridge. The operations just mentioned were then repeated, with variations, thus.—Coal thrown on: after a few seconds, a dense cloud of black smoke was pouring from the chimney mouth, and seemed likely to continue. The plugs were removed, and the air allowed to pass through the tubes and bridge; after the lapse of a few seconds, the wreath of smoke began to fade, and soon disappeared altogether. The tubes were now again stopped, and the fire vigorously stirred, with a will, by the excellent workman, whose confidence in his apparatus it was pleasant to see. Volumes of smoke, that would have delighted the funnel of an ocean steamer, were instantly rolling from the chimney. The tubes were opened; the black cloud gradually dwindled away, till a mere thread of brown vapour was the only vestige of it. Again the apertures were plugged—again the smoke poured forth. Again they were unstopped — again the smoke ceased. These experiments were repeated again, with the same consequences.

These results were completely satisfactory as to the effect of the hot-air tubes. When they were in use, there was no smoke visible; when they were closed, there was as much as proceeds from common furnaces.

To what extent the diminution of the smoke is influenced by the blind-bars beneath the grate of Mr. Woodcock's furnace, I am not prepared to say.

I would not have asked for so much space for a repetition of matter which your readers might pick up in any scrap of letter-press. I have not, however, met in print with the notions I have here thrown together as to the theory of smoke; they may be new to some of your readers—interesting, perhaps, to others at the present season.

I am, Sir, yours, &c.,

CHARLES BLACHFORD MANSFIELD.

Weybridge, Sept. 25, 1854.

## ON THE WORK DONE BY THE PROPELLERS OF SHIPS.

*To the Editor of the Mechanics' Magazine.*

SIR,—If "Y.'s" *object* had been to prove his own utter ignorance of the elementary principles of dynamics, he could not have written a letter better adapted to that end than the last which he has published on this subject. This I can, I think, prove unmistakably. There will be no difficulty in showing, first, that the said letter contains propositions contrary to established elementary laws: second, that its parts are inconsistent with each other. The former of these particulars is proved by the first paragraph, wherein it is intimated that a ship may continue to move uniformly, when the forces which tend to retard her motion are greater than those tending to accelerate it. Now the laws of motion, as stated by Snowball, are as follows:

I. "A body, after being put in motion, if not acted on by some external pressure, will move in a *straight* line, and with an *uniform* motion.

II. "When a pressure acts upon a body after it has been put in motion, the change of motion produced in any given time is in the direction of the pressure, and is proportional to the pressure in magnitude.

III. "When a pressure, applied directly to a body, produces motion, the momentum generated in any given time is proportional to the pressure."

"Y" contradicts all these in rather a bold and surprising manner, saying, that there need be no change of motion, although the pressures acting on a ship be not equivalent to nothing. He says that these elementary laws of motion "remain to be proved." "Y" may be astonished, but I believe no one else will, when I state my opinion that he must be almost, if not quite, the only person who, having given this subject any attention, would dream of questioning the validity of these laws.

Now let me turn to the paragraph commencing with the following very modest sentence: "If I misapprehended 'A Mechanic's' views with regard to the circumstances which determine the power of the engine, and the speed of the ship and velocity of the propeller, the fault does not rest with me." No! certainly not! "Y" could not misapprehend any thing clearly stated! "The expression, R $(v + v')$, establishes no relation whatever between these quantities."

Here we plainly see that "Y" does not know that the work of an engine is computed by multiplying the load of the engine by its velocity. I hope he will not take it amiss if I recommend him to find out what the word "work" means, as employed in writings on mechanics. Perhaps, however, he may not agree with me in believing that some knowledge of a subject is most requisite in a person who pretends to write upon

it. He seems to think that all you have to do, in order to undermine any process of reasoning is, coolly to contradict the conclusion, and then ask a variety of absurd questions, carefully avoiding those that have the slightest power of supporting your negative. On this principle he proceeds to say: "Is it to be understood that the resistance, R, of a ship, moving through the water at the velocity, $v$, varies with the mode of propulsion? If a horse, in towing a ship at the velocity, $v$, has to draw the load, R, does that load increase when the same ship is propelled, at the same velocity, by a propeller?" I suppose it will be wholly useless to tell "Y" that common sense requires that the answer to these very stupid questions should be—No: and that all he has hitherto said would naturally call for a Yes. I cannot expect him to understand this, since we have seen already that he ignores the fact that the power expended in any operation varies as, and is therefore measured by, the product of the pressure and the space through which it is exerted. And so he, of course, does not know that it is precisely because the load, R, is the same while the velocity, $v$, is constant, that an engine driving a propeller would have to do more work than the horse would, if walking with his load on *terra firma:* that if the works were the same, the load of the engine would need to be *less* than that sustained by the horse, when moving the ship at the same velocity. It is in this that "Y" is inconsistent with himself; and therefore my second point is proved.

The concluding interrogation of this paragraph has, perhaps, more point than the rest; this is it:—"What is the work R $(v+v')$, done by the propeller equal to, *besides being equal to itself?*" Although I do not exactly see the force that the words which I have italicised are intended to have, I will answer the question. This work is equal to that done by the resistance on the bows, together with half the *vis viva* communicated to the water which is set in motion by the propeller. I will now just say a few words on some curiosities not yet noticed.

The second paragraph is written on the negative-and-question principle already mentioned, and is indeed a striking example of it. "Y" says, "What has the speed of a locomotive engine to do with the resistance of a train it does not draw?"

In the fourth paragraph I am endowed with a knowledge I do not possess, and shall never attain. I must remind "Y" that some of the work of the propeller is consumed, as I have said above, in putting the water in motion in a direction opposite to that of the ship's course. The table he gives has nothing to do with the matter. If it had in it anything contrary to what I have said, it would be wrong *à priori* whoever wrote it. Does not "Y" know that neither this table nor indicator diagrams can give the resistance on the bows? If he will find out what is the resistance on the bows of a ship at any given velocity, and the indicator horse power of the engine for the same, he will then have the means of either disproving or verifying what I have advanced on this subject. At the same time, I must state my opinion that there are not many, who have any legitimate pretension to a knowledge of the subject, who can doubt at all about it. I should be most happy to comply with his request as to the indicator diagram and the *Rattler*, but I do not possess the work in question, and have never seen it. I hope he does not make the mistake to suppose that the only source of information on this subject is Mr. Bourne's work.

One word to the last paragraph. The best definition of "slip" includes both paddle and screw.

I am, Sir, yours, &c.,

A Mechanic.

## ON ELECTRICITY AS A SOURCE OF POWER.

*To the Editor of the Mechanics' Magazine.*

Sir,—I am happy to contribute some information in connection with the subject adverted to by your correspondent, Mr. Bright, in No. 1625 of your journal.

The application of *magneto-electricity* as a substitute for the usual galvanic arrangement in electro-magnetic machines has, I believe, occurred to most who have been engaged on the subject of electro-magnetism as a source of motive power; and Mr. Hjorth was particularly sanguine as to its success. In ordinary model engines, however, its adoption would greatly add to complexity of structure and expense, the more especially as the construction of batteries has within the last few years been so greatly improved, that we can now induce very powerful magnetism in a bar of soft iron with a few square inches of zinc, where formerly many feet of surface were required to produce the same amount of force.

In large engines, of many horse-power, it cannot be doubted that the prodigious stores of polar force concentrated in such a magnet as that of Mr. Henley and others, may be used for the purpose; but it is equally certain that such magnets may be introduced with much more effect as armatures to electro-magnets, employing them mutually as attractive and repulsive bodies. It has indeed been thought that (so far as our ex-

perience goes) the unlimited magnetic power which can be induced in *soft* iron may be used for the purpose suggested; but Professor Daniell has, by one decisive experiment, set the matter at rest. He employed an electro-magnet, and a constant battery, which was capable of decomposing water by a *primary* current, at the rate of 11 cubic inches of the mixed gases per minute, and obtained only 4 *cubic inches* in the same time by the secondary force; that is to say, by making use of an electro-magnet for the purpose of inducing magnetism in an electro-magnetic engine, about three-fourths of the battery power would be wasted; or, in other words, the cost of producing motive power would be increased three-fold.* The evidence of this eminent man will, no doubt, be considered conclusive; in this case, however, it has the greater weight, since the experiment was made with a far different purpose than that for which I have quoted it; in fact, his intention was to exhibit the *great amount* of the secondary force in question. It has been my intention for some time to forward you a paper on electro-magnetism, comprising what I have practically found important matter, under three heads:—1. The influence of the position and space occupied by the coil or coils on the effective working of an electro-magnet. 2. The influence of disturbing forces, especially that of external resistances; and, 3. The most efficient arrangement for the production of the greatest amount of attractive and repulsive power between an electro-magnet and its armature, whether that armature be merely soft iron, or an ordinary artificial magnet, or an electro-magnet. I should fulfil my intention by this post, but a temporary indisposition prevents my so condensing materials as to render the communication adapted to your journal. Permit me, in conclusion, to remind your correspondent that, in estimating the expense of working an electro-magnetic engine, the cost of zinc in comparison with coal is but one element in the calculation. In some of the Liverpool transatlantic steamers £1,200 would be saved for each passage in freightage room alone, by substituting electro-magnetism for steam, taking no consideration of the cost of about 1,200 tons of coal, and the reduction in the engineering establishment. I also leave out of the question the immense saving of weight, room, and risk by the removal of the boilers, the important conditions of speed and safety secured by having a permanent centre of gravity in the floating mass, the uniform depth of immersion of the paddles, and many more incidental circumstances, of which I have no doubt that Mr. Bright is better able to form a practical judgment than I am myself.

I am, Sir, yours, &c.,

George Kemp, M.D. Cantab.

2, Foulon-terrace, Guernsey, Sept. 7, 1854.

* "Daniell's Introduction to Chemical Philosophy," Second Edition, p. 588—874.

## HIGHWAY BRAKES.

*To the Editor of the Mechanics' Magazine.*

Sir,—The brake Mr. Baddeley mentions in your Number for September 2, as now in use upon the *Times* coach, running between Exeter and Falmouth, is very common in this neighbourhood. It has been made by us for a long series of years, during which it has been the subject of patent by more than one party, and we have heard of many persons paying for the privilege of using it; although, at the same time, it was made and applied at our manufactory for all who favoured us with their orders for them.

But there is another plan of brake for highway carriages vastly superior to this, which, we presume, has not fallen under Mr. Baddeley's notice. In application it is similar to those on the railway carriages. We have attached them to almost every description of carriage used upon common roads with the greatest success. As an instance, we may mention that lately Hansom cabs have been introduced into this city, but were found almost unmanageable in descending the steep hills around this neighbourhood. The proprietor was recommended to consult us upon the application of the drag in question; we have attached it to all, and the result has been most satisfactory; the cabs now travel down our hills with ease and security.

This brake or drag possesses very considerable advantages over the first mentioned.

The first requires the carriage to be stopped, and the horses backed, before it can be extricated from under the wheel, whilst the latter can be applied and released at pleasure, without stopping the horses.

The first is one degree of drag frequently too much for hills of moderate declivity; it admits of no degree of adjustment, whilst the latter can be regulated to suit the hill, and can be so managed, as to enable the horses to run free, without strain upon either trace or backing; and should a level part or newly broken stones occur, the brake can be released, and re-applied to the great benefit of the horses, the carriage, and the road.

It can also be used when going up hill, if it should be desirable to afford rest or relief

to the horses, as the carriage can be readily stopped from running back.

There is also another important advantage which ought not to pass unnoticed, arising from the brake being simultaneously applied to both hind wheels, which causes the carriage to preserve a straightforward course. Whilst the former being to one wheel only, the hind part of the carriage is subjected to a sidelong direction, frequently to a dangerous extent.

It is right we should state, that we do not claim the merit of this invention; it has been long in use upon the continent of Europe, in Edinburgh, Newcastle, and other places in this kingdom; but we can safely say, we have so improved and simplified its mode of application as to remove any objections the original plan might have possessed in the eyes of many.

We are, Sir, yours, &c.,
T. FULLER and Co.
Coach Manufactory, Bath.

## REPLIES TO HYDROSTATICAL INQUIRY.

(*Ante*, page 351.)

*To the Editor of the Mechanics' Magazine.*

SIR,—With regard to the hydrostatical inquiry of "T. T. W.," I think a very little consideration will show any one that the theorem stated is decidedly incorrect. When a floating body of any description is to be raised by the method of locks, such as I have seen, it is evident that the same amount of water must flow into the lock, whatever be the magnitude of the body floating in it; for it is evident, that the excess of the water in the lock, when at the upper level above that in it when at the lower level, is the same whether the floating body be a line-of-battle ship or a straw. Thus, if V be the displacement of the floating body; C, the capacity of the lock at the upper level: *c*, that at the lower level, then the quantity of water in the lock, before the raising begins, is $c-V$: and afterwards, it is $C-V$. Hence the quantity admitted into it during the stay of the floating body in it is

$$C-V-(c-V)=C-c.$$

But when the body is taken out of the lock within the second flood gates, it is evident that a quantity of water equal to that displaced by the floating body flows into the lock; so that the water lost is

$$C-c+V.$$

So that, in fact, the greater the body the greater is the amount of water which must flow from the upper to the lower level.

In descending it is tolerably clear that the amount of water lost from the upper to the lower level would be expressed by

$$C-c-V.$$

So that the larger the body the less is the water lost in its descent.

I am, Sir, yours, &c.,
BREVIS.

*To the Editor of the Mechanics' Magazine.*

SIR,—From the manner in which your correspondent "T. T. W." gives the "assertion" of his acquaintance, at page 351 of your last Number, it would seem as if he entertained strong doubts of its correctness. Permit me briefly to explain the circumstances of the case for his satisfaction.

We will suppose the lock-gates all closed, and the water therein standing at the lowest level; on opening the upper sluice, water will enter the lock until it attains the level of the higher supply, and we will suppose the quantity required for this purpose to be exactly 150 tons. The gates are then opened, and a loaded barge admitted, which displaces, into the upper reservoir, 50 tons of the water previously in the lock. The upper gates being then shut, and the lower sluice opened, the water flows out of the lock until it attains the lower level; the barge then passes out of the lock, and 50 tons of water from the lower supply enters the lock, making the water level precisely what it was before the passage of the barge. Exactly 100 tons of water therefore have passed through the lock, from the higher to the lower level, during the transit of the barge. In *ascending*, however, a larger quantity of water will be expended; because the barge in that case displaces 50 tons of water into the lower portion of the canal, which is lost; while in *descending*, the barge displaces 50 tons of water into the upper level, which is saved. But if, instead of a barge, a cork only had passed with the water through the lock, 150 tons of water would have been transferred from the upper to the lower level, whether the cork had *ascended* or *descended*, the displacement being an almost inappreciable quantity.

It follows, therefore, that a laden boat in *ascending* through the locks of a canal will require as much water as a cork, but that in returning, that is, in *descending*, the quantity of water will be diminished by the displacement of the boat, the boat then requiring 50 tons less water for its transit than the cork.

I am, Sir, yours, &c.,
WM. BADDELEY.
12, Angell-terrace, Islington, Oct. 9, 1844.

## ON WATER AS A CONDUCTOR OF ELECTRIC CURRENTS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I am quite prepared to admit the statement of Mr. C. T. Bright in your last Number, that "the earth is the reservoir to which all *free* electricity from other bodies tends to return;" but cannot for one moment admit, that a current of electricity circulating through a long line of conductors from the positive to the negative pole of a battery (as in the case of electric telegraphs) is *free* electricity, or that such a current in passing through masses of water, forming part of the circuit, is *absorbed.*

If *absorbed,* how is it that the current is *also transmitted,* evidence of which is given by its deflecting magnets, decomposing chemicals, and firing cannon?

Mr. Bright is certainly a curious customer; he first of all gives a theory of the mode of *transmission* of electric currents, which I accept; he then turns round, and states, that the currents are *not* transmitted, but *absorbed!*

Verily, Mr. Bright's *ipse dixit* is no answer to my original question.

I am, Sir, yours, &c.,
WM. BADDELEY.

13, Angell-terrace, Islington, Oct. 10, 1854.

## COLOURING PHOTOGRAPHIC PICTURES.

BY M. MINOTTO.

THE want of colour is chiefly felt in portraits; this deficiency imparts a cold and almost cadaverous air; it renders the likeness less perfect, and often gives an appearance of greater age.

Attempts are made to get rid of this inconvenience by subsequently colouring the photographic image by hand; but it often happens, under this operation, that in striving to correct the work of light, the effect is spoilt, and the resemblance destroyed. On the other hand, bad photographic pictures are frequently made to pass, by correction with colours, so that the resulting product remains no longer a photographic portrait; but a portrait sketched by light and finished by the painter.

The object to be sought, therefore, was to preserve all the delicacy of detail, shadows and half shadows, of photographic pictures, while adding the colours which they require.

That which could not be accomplished by applying colour *upon* the photographic image, has been effected by M. Minotto by the contrary process; that is to say, by applying the colour *behind* the image.

This system of colouring, practised in Germany since the year 1824, and even patented in that country in 1826, was applied to engravings and lithographs, under the names of *oleocaleography* and lithochromy. It is this neglected method which the author has just applied to photography, and this entirely new application is what constitutes his invention.

This method is only applicable to photographs upon glass, paper, linen, or substances already transparent or capable of being made so. The following are the modes of operation for paper; the modifications for application to other substances are very slight and readily comprehensible.

*First method.*—The paper bearing the image to be coloured is to be held up against the light, so that the operator may trace upon the back, with a crayon or pencil, the outlines of the different tints; that is, in the case of a portrait, the outlines of the hair, the flesh, the dress, the whites of the eyes, &c.; then the proper colours are applied upon the different parts, upon the back of the paper. It is scarcely necessary to say that these colours may be of any kind, either water-colour, oil, or made up with varnish, &c.

The colours are allowed to dry, and the paper covered with a varnish which renders it very transparent; the image then appears coloured, and if the operation is well performed, it acquires the aspect of a miniature, and even of an oil-painting.

*Second method.*—The operations may be commenced with varnishing the paper, allowing to dry, and then colouring on the back. The advantage of this mode of proceeding is, that the sketching out with the crayon may be dispensed with; moreover, as the effects of the colours are seen at once, they may be corrected at will. It is evident that in this process colours must be used that will take upon the varnish; if the paper is thin, the outlines may be seen and coloured by transparency, and then immediately varnished.

*Third method.*—The outlines of the portrait may be drawn or traced upon a separate paper or board, and the colours be applied upon this sketch; this is applied to the back of the paper bearing the image; the outlines being made to coincide, and the two papers pressed together, the colours will appear through.

This process possesses the following advantages over the other two:—

1. We preserve intact and uncoloured (though varnished) the image which was actually produced by light.

2. The colours may be easily corrected by painting over the original tints. In the first two processes, the original layer of co-

ways appears, and must be removed lsite to change it.

Ve may give the same image several it aspects, by executing several co- duplicates, thus changing the tint of as, or even, if we wish, for a whim, our of the hair, eyes, flesh, &c. We moreover, use the same coloured paper ious photographic proofs taken from e negative.

Ve may cut out the paper bearing the , and apply it upon several back- s, so as to see which suits best. We ven have grained backgrounds, by the background with gold, silver, ur powder, before the varnish is dry. ough the execution of the work is in ery simple, we think it necessary to nto some details on this head here.

positive proofs to be coloured in this , it is requisite to select paper of very exture, and to reject any which pre- s cottony or unequal aspect when to the light. It is well to try some paper by varnishing pieces of it.

paper should be thin, up to a certain so that the outlines may not be con- Nevertheless, too thin a paper lead to serious inconveniences. The s would not be strong enough, the rregularity in the colours would be the transition from one colour to would be too obvious, and we should tain that softness of tint resulting heir fusion, produced by the veil of one of the merits of this invention; ortant merit, above all, in regard to h.

n the other hand, the paper were too we should run a greater risk of ine- of texture, and the colours would ne out strongly enough. The author rs good strong writing-paper the best. photographic image must be well l, and of a tone appropriate to the which are to be applied to it. It is nportant that the whites should be and the back of the paper free from

colours must always be vivid, for their diminished by the veil produced by the raphic paper, and they must be more in proportion as the paper is thicker ss transparent. On the contrary, ust be of less force in proportion as dows are lighter. Sometimes weak- the shadows may be overcome by two positive proofs instead of one e colour.

tints must obviously be regulated by ure of the object. In portraits, it is rtance to preserve the exact colours hair, of the cheeks, and sometimes the lips and eyes.

It is well to lay on flat tints as regularly as possible; however, as the superposition of the paper blends them very well, inexperience leads to no great inconvenience, provided the paper is of sufficient thickness. It is most important not to overrun the outlines.

The varnish must be colourless, and such that the paper, once dry, preserves its transparency, and does not become yellow. It is well known that several kinds of varnish exist which fulfil these conditions. Mastic varnish is very good. That which was used in *oleocaleography* may also be employed; it consists of—

| | |
|---|---|
| Spirits of turpentine | 7 parts. |
| Mastic, of the finest quality | 1 part. |
| Venice turpentine | 3 parts. |
| Powdered white glass | 10 parts. |

Wax may also be employed, or oil, in particular oil of *ben*, and other substances having the power of giving a durable transparency to paper.

[The varnish sometimes used in making tracing paper would probably succeed well. It consists of Canada balsam dissolved in spirits of turpentine.—Ed. Ph. J.]

—*Génie Industriel, and Journal of the Photographic Society.*

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Conner, Albert Wentworth, engineer, of Crooked-lane, Cannon-street, London. *Improvements in the apparatus used for moulding bricks and lumps.* Patent dated March 14, 1854. (No. 610.)

This invention has for its object improvements in machinery for moulding bricks where a chain or succession of moulds is used, for which purpose the moulds are made of wrought sheet-iron; each mould consisting of three sides, the fourth side being the outer surface of one side of the next mould. "Sheet-iron of the proper width is bent, so as to form three parts of a mould, but in place of bending the sheet at right angles simply, it is bent at the angles of the mould into a cylindrical form, and the angles of the mould are formed by the coming together of the sheet metal after it has been bent into a cylindrical form; hence, each mould will at its angles be composed of two sides, and where the sides come together and form the angles of the mould, there are cylinders outside of the angles, which fit on studs formed on the chain, which moves the moulds through the machine, and these cylinders also form stops to the two sides of the next mould. These moulds are coated with asphalte or bituminous matter and sand; and in order

to sand the moulds as they go up to be filled, a box or trough is used, with a perforated bottom, suspended on a spring or springs, and motion is given to such trough by a connecting rod acted on by a cam. In order to remove any excess of clay or brick-earth from the moulds as they pass along, a combined scraper is used; the first portion is a straight edge of sheet-iron, which comes under and in contact with the filling-roller, the edge keeps the roller scraped, and the under surface removes the excess of brick-earth or clay, and the other portion is a blade, the edge of which stands across the mould at an angle, and is pressed down by a weight or spring at one end, which moves any clay or brick-earth which may have risen after passing the other scrapers."

SWAN, JOHN HOLLEY, of Glasgow, Lanark, commission merchant. *Improvements in drying bricks, tiles, and other articles made of brick-earth.* Patent dated March 14, 1854. (No. 611.)

This invention consists in constructing long drying kilns or arches with railways through them, in such manner that carriages may be moved into and through the kilns or arches with articles formed of brick-earth suitably arranged on frames, to facilitate the transfer of the heat of the interior of the kilns to the surfaces of such articles. The lower parts of the arches on which the railways are supported are formed also of arches, under which furnaces are constructed, by which the kilns or arches are heated, and provision is made for carrying off the damp vapour.

HANDS, JOHNSON, of Epsom, Surrey. *Improvements in kilns.* Patent dated March 14, 1854. (No. 612.)

Instead of allowing the heat to pass away at the top of the kiln into the atmosphere, Mr. Hands closes his kiln in at the top in such manner that the heat may be caused to enter a flue, which descends to a horizontal flue or flues in a chamber suitable for drying purposes, which flue returns and passes up the kiln and in contact therewith, so as to be highly heated, in order that no black products or smoke may get away into the atmosphere. The descending flue is made double; one compartment of it receiving and being charged with damp sand, which runs out when dry at the lower end, and the other compartment or flue forming the passage for the heat and products from the kiln, as above explained.

WOODFORD, JAMES, of Hatton-garden, watchmaker. *A smoke-consuming rotary grate.* Patent dated March 14, 1854. (No. 613.)

The inventor constructs a grate in a cylindrical or other form, with plain or perforated ends and openings and bars round the periphery, and divides this grate into a number of compartments, by placing bars across the interior, making the bars on the periphery of each compartment moveable, for supplying the same with fuel. In the centre of each end a stud is fixed, and upon these studs or upon a bar running through the grate, the latter rotates. The inventor makes this arrangement for the purpose of producing a more perfect consumption of the products of combustion, by placing the fuel in one of the compartments, and then by adjusting (by means of a wheel) the position of the grate, so as to cause the products of combustion from the fuel last supplied to pass through the fire with which it is placed in contact.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in sector presses.* (A communication.) Patent dated March 15, 1854. (No. 614.)

This invention, comprising improvements in sector presses employed for punching, cutting, and pressing metals, &c., consists—firstly, in a method of combining the sectors, so that contact at their rolling edges shall always be insured, and slipping prevented: secondly, in a method of locking and insuring the proper set of the sectors at the moment of starting: thirdly, in the application of the sectors reversed to act as a power to withdraw the punch: and, fourthly, in a mode of applying springs to support and lift the eccentric sector, and to aid in keeping it up to its proper place.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in producing waterproof stuffs.* (A communication.) Patent dated March 15, 1854. (No. 615.)

In carrying out this invention, one of the surfaces of the cotton, wool, or other stuff has first to be raised by means of teazles, after which it is dyed the same colour as the varnish to be applied. The composition employed is prepared as follows:—"I introduce," says the patentee, "about eleven pounds of white lead, nine pounds of litharge, twelve cuttle fish, and two and a quarter pounds of acetate of lead, into about ninety quarts of clarified linseed oil, made to boil during about six hours over a slow fire. I steep the colours which I desire to apply during about six hours, then pound and add them to the oil prepared, as before described, and diluted with an essence. I spread this matter in a state of cold paste over the stuff while well stretched on a suitable frame. I set it to dry in the open air, then apply four coats more of the preparation; I pounce it twice, then apply the required impression, and a light varnish."

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Improvements in heating apparatus.* (A communication.) Patent dated March 15, 1854. (No. 616.)

"This invention consists," says the patentee, "in causing a current of cold or warm air to enter a box terminated at its upper part by a grate, which may be fixed or moveable, and which new mode of heating may be rendered applicable to stoves and furnaces in general."—"The current of air is directed and regulated, and having no other exit than through the interstices of the fuel, the required activity of combustion can always be kept up, by which a greater portion of the smoke and gases is utilized."

Kaye, Thomas, of Huddersfield, York, ironmonger. *Improvements in the manufacture of gas, and in the apparatus employed therein.* Patent dated March 15, 1854. (No. 617.)

This invention relates—1. To making gas retorts with a flue or flues through their centres, partially closed on the top for the concentration of the heat, which afterwards circulates through openings to the upper flue and chimney, "by which plan I gain," says Mr. Kaye, "a much greater heating surface than is obtained by the retorts now in use." 2. To making the side flues curved, "so as to give a greater heating surface, and consequently to generate a greater quantity of gas from the same amount of fuel than can be done by the present system." 3. To fixing a vessel over the mouth-piece, supplied with a continual stream of cold water, to prevent the accumulation of tar in the escape-pipe; and, 4. To placing a bonnet at the upper part of the front of the retort, connected with a flue leading to the chimney, to take off the unpleasant effluvia which arises when the retorts are being charged.

Holt, Thomas Stephen, and Charles Herbert Holt, of Manchester, Lancaster, engineers. *Improvements in steam boilers.* Patent dated March 15, 1854. (No. 618.)

This invention consists in constructing the boiler with two longitudinal tube-plates, in which are placed an indefinite number of small tubes in the centre of an ordinary flue, having a water space between them, thereby dividing the main flue into two separate flues, which are again divided by stops into a number of combustion-chambers. The flame or heat passes alternately up and down the small tubes into the different combustion-chambers to the end of the boiler, and from thence into the chimney, or through brick flues in the ordinary manner.

Oates, Joseph Pimlott, of Lichfield, Stafford, surgeon. *Improvements in the manufacture of bricks, tiles, pipes, and such other articles as are or may be made of clay.* Patent dated March 15, 1854. (No. 619.)

*Claims*—1. A method of preparing clay for moulding into bricks and other articles, and propelling the same into the moulds by the rotation of a shaft carrying screws at its upper and lower ends, and provided with pug-knives in the immediate space. 2. The use of a chamber situated between the feeder, by which the prepared clay is supplied, and the mould in which it is to be fashioned, the said chamber changing the sectional form of the clay during its passage through the same from the figure it has on leaving the feeder to that which it is most suitable to give it before entering the mould. 3. The use of an expanding and contracting rectum or opening through which the surplus clay passes, the object of the said rectum being to maintain any required degree of pressure on the column of clay. 4. A method of smoothing or planing the face of a brick by causing it to pass over a slot, by the edge of which the face of the brick is planed and the surplus clay removed.

Whitaker, Laurence, of Haslingden, Lancaster, cotton-spinner, and Greenwood Lyons, of the same place, manager. *Certain improvements in grinding or setting the main cylinder of carding-engines used for carding cotton and other fibrous materials.* Patent dated March 15, 1854. (No. 620.)

These improvements consist in providing an extra loose pulley upon the driving-shaft of the main cylinder upon which the common driving-strap is passed, which being disengaged from the fast driving-pulley, of course ceases to drive the cylinder in the direction in which it was running whilst "carding." On this loose pulley is secured a bevel-wheel, which is brought into gear with a second bevel-wheel on the same shaft, simply by elevating a small bevel-pinion, by which means a reverse motion is obtained.

Houston, John, junior, of Glasgow, Lanark, mill-manager. *Improvements in working steam boilers, and in apparatus connected therewith.* Patent dated March 15, 1854. (No. 621.)

*Claims.*—1. A mode of regulating the water supply of steam boilers by the aid of a float, acting by means of suitable connections passing through the boiler case upon the stop-cock of the supply-pipe. 2. A mode of causing the float used in marine steam boilers, for indicating or regulating the water-supply, to work in a chamber or casing formed in the boiler and communicating with the main boiler space by a small aper-

ture or apertures. 3. A mode of adjusting the position of the flue-damper of a steam boiler furnace, by means of a piston acted upon by the steam pressure, and arranged to open or shut a water-supply cock in connection with the damper movement, in accordance with the variations of the steam pressure. 4. A mode of shifting the flue-damper of a steam-boiler furnace by means of a water bucket or float, which is raised or lowered by the varying level of water passing through the bucket, or through the cistern containing the float, the egress of such water being uniform whilst the supply is made to vary in accordance with the steam pressure.

TRUEMAN, ALFRED, of Swansea, Glamorgan. *An improved furnace for the calcination of copper ores and other mineral substances.* Patent dated March 15, 1854. (No. 622.)

In this furnace are arranged several retorts or tubes, side by side (by preference), and on the same level; these retorts are cylindrical, and one end of each communicates with the one next to it. They are heated by a fire at one end of the series, the flame from which passes under and over each retort, so that the one nearest the fire is heated most, and that farthest from it least, and the others in proportion, according to their distance from the fire. It is not necessary that the retorts should be placed side by side, and on the same level; they may be placed on an incline, or one above the other, suitable arrangements being made for heating each retort to a different temperature. The ore or other mineral substance is introduced at or near one end of the retort farthest from the fire, suitable apparatus being provided to admit the requisite quantity from a hopper placed above. A worm or screw is caused to revolve by suitable motive power through the whole length of the retort, in such manner that the substance introduced may be moved through to the other end of the retort, whence it passes to the second, and by the action of a screw is moved through it to the opposite end, and thence to the third, and so on. After it has passed through the last retort of the series, it is pushed out by the action of the screw, and falls into a receptacle provided for it. Air may or may not be admitted to the substance, according to the effect wished to be produced by the calcination.

WEATHERLEY, WILLIAM, and WILLIAM JORDAN, of Chartham, near Canterbury. *Improvements in steam boilers.* Patent dated March 15, 1854. (No. 623.)

"This invention has for its object improvements in applying tubes within a flue, which passes through a steam boiler, in order to get more extensive heating surfaces. For this purpose a steam boiler is constructed with a flue which passes through it, as is the case with Cornish and some other boilers. Within this flue, and over the fire-place or furnace (which, as usual, is constructed within the tubular flue), is arranged an arch of tubes, which at their front ends are connected with a water-space, which by a tube is connected with the main boiler. The back ends of the tubes are connected with a water-space moveable within the flue, and connected by a tube with the main. To the back of this second water-space are affixed numerous tubes, which at their back ends are fixed to another water-space, also moveable in the interior of the flue, and so on according to the length of the boiler flue. The water-spaces are so arranged as to form partitions transversely across the upper part of the boiler flue, leaving a space below for the passage away of the heat and products of combustion to act on the next series of tubes, and the main boiler, and lastly to the chimney or shaft. The last water-space is connected with the feed-pump; hence the water is fed, first through the tubes most distant from the fire, and then through the hotter and hotter tubes, and the water ultimately passes into the main boiler."

LE GROS, ANTOINE EDOUARD PASCHAL, of Paris, France. *Improvements in preserving timber, and generally all kinds of wood.* Patent dated March 15, 1854. (No. 624.)

*Claim.*—Preserving all kinds of wood or timber, or organic matter, by means of a solution of a double salt of manganese and of lime, or of a double salt of manganese and of zinc, used either alone or with an admixture of creosote.

KEATES, THOMAS WILLIAM, of Chatham-place, Blackfriars, London, chemist. *Improvements in the means of distilling turpentine and other resinous matters, and in manufacturing boiled or drying oils.* Patent dated March 15, 1854. (No. 625.)

*Claims.*—1. "The application of superheated steam or heated air to a still as a source of heat in the distillation of turpentine and other resinous substances, such superheated steam or heated air being made to pass through or along a coil of pipe, or caused to circulate in a steam jacket or envelope for the purpose above set forth." 2. "The use of superheated steam or heated air, either confined in a close pipe, coil of pipe, or jacket, or blown freely through suitable perforations into the mass of the oil, as a means of producing in certain oils that chemical change which imparts to them the property of drying rapidly, which renders them, in fact, what is known in commerce as drying oil."

BINNS, MILES, and JOHN POLLARD, both

lford, York. *Improvements in appa-*
*or combing wool, cotton, silk, flax, or*
*brous substances.* Patent dated March
14. (No. 627.)
us.—"The novel mode set forth of
ning the operation of hand combing,
placing two of the combs employed
h operation as that the teeth or
ts of one of the said combs are main-
cross-wise of the teeth or brackets of
er and fixed combs, whilst the work-
operating with a third comb upon
rous material in the two first-men-
combs; or any other arrangement of
f such said combs, provided the
r brackets thereof cross each other
re stated."

.RE, ROBERT, of Prince's-road, Wool-
Kent. *Improvements in the construction of*
*c batteries, and in apparatus connected*
*th.* Patent dated March 16, 1854.
29.)
inventor claims a mode of inclosing
sitive and negative plates in porous
or any other suitable porous mate-
mode of turning up the edges of
tes for the purpose of fixing cement
s; and a mode of constructing the
r cells of batteries, reservoirs, and
osition vessels with marine glue,
calico, or similar substances, &c.

HUNE, DONALD, of Toronto, Canada
*Improvements in the construction of*
*propelled by steam.* Patent dated
16, 1854. (No. 630.)
.—"Constructing the holds of vessels
ells or separate compartments com-
ting with each other, and the use
ployment of such said bells for the
of fuel and cargo, as set forth, or
odification thereof, by which the
g of the bulk of the weight is
l."

RSON, FREDERICK WILLIAM, of
le Chemical-works, near Penzance,
ll, manufacturing chemist. *Improve-*
*in machinery for pulverizing, washing,*
*algamating quartz and matters con-*
*gold and silver.* Patent dated March
4. (No. 631.)
Inventor claims "combined ma-
whereby double coned rollers are
a rotating-trough, the bottom of
is composed of two inclines, corre-
ng with the conical form of the
used."

ANAH, JAMES, of Liverpool, Lan-
builder. *Improvements in sails for*
*le vessels, and in the apparatus for*
*g them.* Patent dated March 16,
(No. 632.)
invention consists of a vertical roller,
ed on suitable bearings, on which the
wound when not in use. When the
sail is required to be reefed or reduced it is partially rolled up on the roller.

LILLEY, JOHN, of Birkenhead, Chester, merchant. *A new material suitable for spinning, either alone or combined with other fibres, and suitable to the manufacture of pulp; also certain machinery employed in the preparation thereof.* Patent dated March 16, 1854. (No. 633.)

A full description of this invention formed the first article of No. 1624.

MARSHALL, JAMES GARTH, of Leeds, York, flax-spinner, and PETER FAIRBAIRN, of the same place, machinist. *Improvements in machinery for combing tow, flax, wool, hair, and other vegetable or animal fibres.* Patent dated March 16, 1854. (No. 634.)

The main objects of this invention are—1. To impart to the drawing-off rollers of combing machines, constructed on Heilmann's principle, an intermittent rotary motion, by means of gearing instead of by friction of contact, as heretofore; and 2. To apply thereto a means of condensing the combed fibres into a firm sliver or ribbon. By the addition to Heilmann's machine of these improvements the inventors propose to increase its working capacity, and materially to add to its durability.

GERARD, JOHN, of Guernsey, soap-manufacturer. *Machinery for cutting and stamping soap.* Patent dated March 17, 1854. (No. 635.)

The inventor claims certain described cutters and stampers fitted to frames and gearing, so as to cut a block of soap into any required number of slabs at one operation, and to cut the slabs into any required number of bars or cakes at one operation; and also a stamper for stamping or making the whole or any given number of the bars or cakes at one operation.

HOLT, WILLIAM, of Bradford, York, organ builder. *Improvements in reed-pipes for organs.* Patent dated March 17, 1854. (No. 636.)

This invention consists in the application of a pneumatic lever or valve to the reed-pipes of organs in such manner, that on the wind being admitted to the same, it immediately dilates, and by means of suitable apparatus the reed or tongue is struck, and is thereby caused to vibrate instantly, the wind at the same time acting upon the reed, keeping it in vibration.

HARRIS, RICE WILLIAM, of Birmingham, Warwick, glass manufacturer, and THOMAS PATSTONE, of Birmingham, aforesaid, warehouse clerk. *An improvement or improvements in shades or glasses for gas and other lamps.* Patent dated March 17, 1854. (No. 637.)

*Claim.*—"Covering the tops of shades or glasses of gas and other lamps with a cap or

dome, through lateral perforations or indentations in which, or in the shade or glass, the heated air and products of combustion are allowed to escape."

HERAPATH, THORNTON JOHN, of Bristol, analytical chemist. *Improvements in the manufacture of manure from sewage, which are also applicable to the preparation of other artificial manures.* Patent dated March 17, 1854. (No. 638.)

*Claim.*—The employment of the coke of Boghead coal or Torbanehill mineral in the manufacture of sewage manure and other artificial manures, as a means of deodorising, drying, and absorbing them, and thus of rendering them more portable and less offensive than by any treatment they now undergo.

HENDRY, ALEXANDER, of Port Glasgow, Renfrew, baker. *An improvement in heating bakers' ovens.* Patent dated March 17, 1854. (No. 640.)

*Claim.*—The heating of bakers' ovens by passing flame, heated air, and other hot products of combustion, through one or more pipes, or other suitable conductors placed within the oven itself.

BARTH, GEORGE HARMAN, of Mornington-crescent, Hampstead-road, Middlesex, medical galvanist. *Improvements in the mode of supplying and administering gases for the alleviation and the cure of certain diseases.* Patent dated March 17, 1854. (No. 641.)

*Claims.*—1. The supplying of gas to be used for curative purposes in a portable form by compression in a strong vessel. 2. The attaching the vessel containing the condensed gas to any apparatus in which it can be measured and diluted, and from which it can be inhaled for medical purposes. 3. A mode of including the vessel containing the condensed gas in the gore or cylinder of the tank of the gasometer. 4. The use for medical inhalation of a bag of flexible material instead of the gasometer, in connection with a strong vessel to hold the condensed gas.

REYNOLDS, GEORGE WAIDE, of Birmingham, Warwick, manufacturer. *A new and improved fabric to be used in the manufacture of stays or corsets.* Patent dated March 18, 1854. (No. 644.)

*Claim.*—" A new or improved fabric to be used in the manufacture of stays or corsets, the said fabric being a double loom stitched 'cordel,' the weft of the upper cloth, or the weft and warp of the upper cloth of which are composed of linen."

HICK, JOHN, of the Soho Ironworks, Bolton-le-Moors, Lancaster, Engineer. *Improvements in apparatus for heating the cylinders of steam engines.* Patent dated March 18, 1854. (No. 646.)

*Claim.* — " Heating of the cylinders of steam engines by means of a continuous current of hot air."

DANTEC, WILLIAM, of New Quay, Liverpool. *Improvements in purifying water.* Patent dated March 18, 1854. (No. 648.)

This invention " consists in the purification of water containing earthy salts in solution, such as sulphates or carbonates of lime and magnesia, or other impurities, by mixing with such water a quantity of hydrate of barytes, either in the solid state of solution sufficient to decompose such salts, which together with the barytes, are precipitated, the barytes being added till no more impurities are thrown down thereby."

PARSONS, PERCEVAL MOSES, of Duke-street, Adelphi, Middlesex, civil engineer. *Certain improvements in the construction of the permanent way of railways.* Patent dated March 18, 1854. (No. 649.)

*Claims.*—" Securing, supporting, and connecting the rails of railways, by means of chairs made with ribs or flanges on their under side, for the purpose of increasing their strength. The application of blocks or cushions, of suitable elastic material (particularly wood, with the fibres in the direction before described), in the chairs, to receive the pressure of metal keys or wedges between the rails and the elastic cushions or blocks," &c.

MARS, EDOUARD DE, of Paris, France, gentleman. *Certain improvements in windlasses or capstans.* (A communication.) Patent dated March 20, 1854. (No. 651.)

A full description of this invention will hereafter be given.

ESNOUF, EDWARD, and CHARLES MANGER, jun., both of Jersey, and GEORGE WASHINGTON LEWIS, also of Jersey, carpenter. *Improvements in portable dwellings and vehicles for travellers or emigrants.* Patent dated March 20, 1854. (No. 655.)

*Claims.*—1. Constructing the walls or sides of tents of a series of frames hinged or otherwise secured together, and a telescopic pole for supporting the cover. 2. The application of certain frames to form a chest or box, and a cart or other form of vehicle. 3. A clip or fastening for securing the frames, and the application of parts of the chest or vehicle to form articles of furniture.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

RUSSELL, FREDERICK, of Clarence-gardens, Regent's-park, Middlesex, mechanic. *Improvements in apparatus for clearing obstructions on railways.* Application dated March 14, 1854. (No. 609.)

These improvements consist in fitting to the front of the engine, or leading carriage,

or truck of the train a peculiar shield, made either pointed, or sloping back from the centre on each side. This shield is nearly the width of the line, leaving a clearance of about two inches on each side between the edge of the shield and the inner side of the rails.

PEAD, GEORGE, and CORNELIUS WYATT, both of Conduit-street, Regent-street, Middlesex. *An instrument for readily ascertaining the wear of the bearings of railway carriages.* Application dated March 15, 1854. (No. 626.)

"This invention consists in the employment of an instrument for the purpose of gauging the amount of wear which has taken place in the bearing brasses, or those parts which bear upon the axles upon which the running wheels are fixed, and by which the weight of the carriages is supported."

POISSON, CYPRIEN, gentleman, of Paris, and LOUIS JACQUES MARTIN, engineer, of Paris. *Improvements in printing fabrics.* (Partly a communication.) Application dated March 16, 1854. (No. 628.)

"*Preparation of the fabrics.*—1. In a pint and three quarters of water mixed with a pint and three quarters of liquid ammonia or volatile alkali, we steep the fabrics for ten minutes and then dry them; after which we imprint with colour as follows. *Preparation of the said colour.*—2. We take five parts of baked linseed oil and one part of liquid ammonia; we saponify the five parts of oil with the one part of liquid ammonia. We grind the colour and then imprint the fabrics, either in the manner used by lithographers, or with the ordinary machines of cotton printers. 3. When the fabrics have been prepared and printed, as above directed, two days after the printing we make two separate baths, one composed of four ounces and a half of rock alum, dissolved in a pint and three quarters of water, and the other composed of a pint and three quarters of liquid ammonia, mixed in a pint and three quarters of water. 4. The fabrics, when printed, are passed through the alum-bath, and immediately afterwards through the alkali-bath, in order to obtain a precipitate of alumina upon the fabrics, which perfectly fixes the colour. We reserve the right of using all the alkalies, either in crystal or liquid, either in the preparation of the colours or for saponifying or steeping the fabrics."

SCOTT, THOMAS WALKER, of South Devon-place, Plymouth, Devon, esquire, B.A., limestone merchant. *Improvements in the preparation or manufacture of Devonian limestone.* Application dated March 17, 1854. (No. 639.)

These improvements consist in the manufacture of hydraulic lime from those portions of the Devonian stone which contain a proportion of clay, and which hitherto have been useless, or nearly so, for the purposes of commerce. The stone is burnt in the ordinary way, and is then ground to a powder and may be employed in the usual manner.

BASSNETT, THOMAS, of Liverpool, Lancaster, optician and nautical instrument maker. *An improved mode of compensating for the deviation of the needle of ships' compasses occasioned by local attraction.* Application dated March 17, 1854. (No. 642.)

In carrying out this invention, the amount of deviation having been ascertained, it is carefully marked on a plain card, and allowance having been made for the deviation, the card is divided all round into points or degrees. "For instance," says the patentee, "supposing the standard compass on shore indicates N. 45 E., and the binnacle compass on board, N. 30 E., I, in adjusting or correcting the compass, mark N. 45 E. on the plain card at the point corresponding to N. 30 E., and so on all round the card."

HUGHES, JAMES, of James-street, Bethnal-green-road, Middlesex, designer. *An improved mode of operating the Jacquard apparatus of looms employed in figure-weaving.* Application dated March 17, 1854. (No. 643.)

The object of this invention is to render the employment of a second Jacquard apparatus (now used for producing the ground work) unnecessary. This is effected by applying two sets of cards to the same Jacquard cylinder, one set for producing the ground and the other the figure.

HYDE, JOHN, of Stockport, Chester, spindle and flyer maker, and JOHN HARPER, of the same place, manager. *Improvements in the construction of spindles and flyers for roving and slubbing frames.* Application dated March 18, 1854. (No. 645.)

This invention consists in an improved mode of shaping the top of the spindle and the socket of the flyer for the purpose of attaching the one to the other.

THORNE, WILLIAM, of Barnstaple, Devon. *Improvements in reducing metallic ores.* Application dated March 18, 1854. (No. 647.)

This invention consists—1. In the employment of an annular gutter or hollow vessel placed and supported vertically, and revolving round its axis. 2. In the employment of hollow spheres or balls of metal, partially filled with quicksilver, either separately or in combination with other metals, for the purpose above mentioned. 3. The discharging of a current of electricity through the ores during the processes of crushing and amalgamation.

HODGE, PAUL RAPSEY, of Moorgate-street, London, civil engineer. *Improvements in reducing metallic ores.* Application dated March 20, 1854. (No. 650.)

"The machine I use," says the inventor, "is of a dish or vaseous form, with a large mouth revolving on a hollow axis or shaft fixed to the machine at the opposite side to its mouth. Through this axis it is fed with water, balls are placed within the machine, and when fed with ores and set in motion, the ores are crushed by the balls."

TEMPEST, ROBERT, and JAMES TOMLINSON, machinists and co-partners, and HENRY SPENCER, manager, all of Rochdale, Lancaster. *Certain improvements in the method of cleansing sheeps' wool, and in the machinery or apparatus connected therewith.* Application dated March 20, 1854. (No. 652.)

These improvements consist in cleansing the wool from all burrs or impurities by passing it through machinery provided with revolving beaters and knives, or blades placed at a suitable angle, and in almost immediate contact with the beaters.

BIRD, JOHN, junior, of Manchester, machinist. *Improvements in the manufacture of silk into threads required for woven fabrics, for sewing, and for other purposes, and in machinery to be used for these purposes.* Application dated March 20, 1854. (No. 653.)

This invention "relates only to the manufacture of threads from the natural thread or filament of the silk-worm, formed by combining and twisting the natural thread; and its intention is to accomplish this object in a more direct manner, and by fewer operations than are at present practised."

## PROVISIONAL PROTECTIONS.

*Dated May* 31, 1854.

1209. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture or production of boots, shoes, and other protectors for the feet, and in the materials, machinery, or apparatus employed in such manufacture.

*Dated September* 13, 1854.

1989. William Muir Campbell, of Glasgow, Lanark, furnace builder. Improvements in furnaces or fire-places, and in the prevention of smoke.

1991. John Brookes, of Birmingham, Warwick, manufacturer. A new or improved waistcoat.

1993. Joseph Betteley, of Liverpool, Lancaster, anchor manufacturer. Improvements in giving elasticity to ships' standing rigging.

*Dated September* 14, 1854.

1995. John Hossack, of Manchester, Lancaster, engineer. Improvements in machinery or apparatus for measuring the flow of water, or other liquids and fluids.

1999. Alfred Wilson and George Wilson, of Nottingham, hosiery manufacturers. Improvements in knitting machinery.

2001. William Bramwell Hayes, of Manchester, Lancaster, manufacturer. Certain improvements in looms for weaving.

2003. Thomas Purdon, of Hull, ironmonger. Improvements in safety lamps.

2005. George Frederick Evans, of Hanover-lodge, Kew-bridge, Middlesex, gas engineer, and Frederick John Evans, of the Gas-works, Horseferry-road, in the same county, gas-engineer. Improved apparatus to be used in the distillation of coal and other bituminous or resinous substances.

*Dated September* 15, 1854.

2007. John William Perkins, of Poplar-terrace, High-street, Poplar, Middlesex, analytical chemist. Improvements in purifying gas, the residuum arising from which forms a new artificial manure.

*Dated September* 16, 1854.

2009. Samuel Collins, of Birmingham, Warwick, brass-founder. A new or improved castor for furniture.

*Dated September* 18, 1854.

2012. John Ashworth, of Bristol, manager of the Great Western Cotton Works. Certain improvements in sizeing and stiffening textile materials or fabrics.

2014. George Thorne and Samuel Lemon, both of Fore-street, London, gas-light furniture manufacturers and brass founders. Improvements in facia-boards, sign boards, or name-boards.

2016. Oscar Delloye Smal, manufacturer, Huy. A new system of oven for metals.

2018. Thomas Lewis and Abraham Bartle, of Birmingham, Warwick, machinists. Improvements in apparatus for purifying water.

*Dated September* 19, 1854.

2020. George Piercy and George Collins, of Judd-place West, New-road, Middlesex, bath manufacturers. Improved apparatus for heating and supplying heated liquids to baths, useful also for supplying heated liquids for other purposes.

2022. Joseph Porter, of the Salford Screw Bolt-works, near Manchester, Lancaster, engineer and tool maker. Improvements in machinery for cutting, punching, forging, and forming nuts, bolts, screws, and various other articles in metal.

*Dated September* 20, 1854.

2026. Martin Billing, of Birmingham, Warwick, stationer, and Walter George Whitehead, of Birmingham, aforesaid, accountant clerk. A new or improved waterproof paper.

2028. William Garnett, of Low Moor, near Clitheroe, Lancaster, spinner and manufacturer. Improvements in and applicable to machines for warping and sizeing yarns or warps.

2030. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in ovens or furnaces for melting or manufacturing glass. (A communication from P. Hutter and Co., of Rive de Gier, France, glass manufacturers.)

2032. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in machines for drilling stone. (A communication.)

2034. Auguste Edouard Loradoux Bellford, of Castle-street, London. A new and improved governor for engines and machinery. (A communication.)

2036. Auguste Edouard Loradoux Bellford, of Castle-street, London. A new mathematical instrument, to be termed the "horometer," for the purpose of solving problems in plain and spherical trigonometry, one feature of which invention is or may be applicable in the construction of other mathematical instruments. (A communication.)

*Dated September* 21, 1854.

2038. William Prior Sharp and William Weild, of Manchester, Lancaster, machinists. Improvements in machinery for winding, cleaning, doubling, spinning, and throwing of silk.

2040. Matthew Moneyment, of Lamb's Conduit-street, Holborn. Improvements in hat, bonnet, and other boxes.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 10th,* 1854.)

1165. Edward Everall and Thomas Jones. Waterproofing all kinds of cloth, clothing, silk, and leather, without injury to their respiratory properties, flexibility of fabric colour, or appearance.

1184. Thomas Bazley. Improvements in and applicable to furnaces and vessels used in connection therewith, for the manufacture of glass.

1193. Richard Tomlinson. The application of a new material or fabric to the manufacture of plasters for medical or surgical purposes.

1200. Hall Colby. Improvements in instruments for taking altitudes, levels, and angles, which he designates "Colby's Altimeter, or self-adjusting quadrant or sextant."

1206. William Edward Wiley and Edward Lavender. Improvements in the manufacture of certain kinds of metallic pens.

1209. Julian Bernard. Improvements in the manufacture or production of boots, shoes, and other protectors for the feet, and in the materials, machinery, or apparatus employed in such manufacture.

1214. John Arrowsmith. Improvements in steam boilers.

1223. Charles Maschwitz. A new or improved instrument for paring and slicing apples, potatoes, and other fruits and roots. (A communication.)

1229. John Mason and Louis Christian Koeffler. Improvements in scouring and in washing wool, hairs, and yarns, and in machinery or apparatus for effecting the same.

1233. Thomas Lenox. A novel mode of reefing topsails, jibs, and other sails, from the decks of ships whilst at sea.

1247. Napoleon Néron. Improvements in muskets, carbines, fowling-pieces, and other fire-arms. (A communication.)

1262. John Wilson. An improved pump, applicable to mines, wells, ships, fountains, and domestic purposes, and raising melted metals in foundries, so constructed that it cannot lose water, draw grit, draw air, or freeze.

1263. Joseph Kaye. Certain improvements in machinery or apparatus for slubbing, roving, spinning, and doubling wool and other fibrous materials.

1291. Antoine Louis Pèter. Improvements in treating a certain kind of indigo.

1321. Joseph Fourdrinier. Improvements in machinery for washing, boiling, cleaning, and bleaching rags, fabrics, and textile substances.

1337. Joseph Oliver. An improved construction of signal lantern.

1381. David Clovis Knabb. Certain improvements in the production of carburets of hydrogen.

1466. George Daniell Bishopp. Improvements in the construction and arrangement of engines to be driven by steam, air, gases, or water.

1589. Francis Herbert Wenham. Certain improvements in steam-engines.

1608. Richard Archibald Brooman. An improvement in treating raw silk fabrics, while being dressed and dyed. (A communication from Messrs. C. Jandin and A. Duval, of Lyons, France.)

1629. William Grundy. Certain improvements in the manufacture of "drugget." (A communication.)

1784. Francis Higginson. Effecting certain improvements in the mode of laying, directing, and aiming with ordnance, ship, garrison, and battering guns and field-pieces of every description.

2003. Thomas Purdon. Improvements in safety-lamps.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed October* 6, 1854.

796. Emile Dupont.
800. Julian Bernard.
801. James Worrall, junior.
807. Frederick Robert Augustus Glover.
820. William Naylor.
821. William Naylor.
843. Zachariah Round.
847. Charles Anthony Noedl.
881. Thomas Hawkins.
883. William Henry Bentley.
897. Jean François Felix Challeton.
949. John Lawson and Somerville Dear.
1029. George Barry Goodman.
1049. Henry Tylor.
1055. John Platt.
1091. George Manwaring and William Alltoft Summers.
1145. John Biggs.
1255. John Nicholson.
1273. Richard Archibald Brooman.
1645. Thomas Huckvale.
1711. Samuel Lawrence Taylor.
1725. George Addison Cox.

*Sealed October* 10, 1854.

848. John Mitchell.
850. Thomas Schofield Whitworth.
854. Benjamin Fothergill and William Weild.
864. Emile William Hansen.
867. John Greenwood and Robert Smith.
869. James Griffiths.
873. Thomas Lawes.
875. Alexander Chaplin.
879. George Louis Felix Tiret.
884. Benjamin Fullwood.
928. Joseph Gill.
961. Frederick Woodbridge.
970. Joseph Porter and Richard Hewson.

971. Edward Briggs and William Souter.
1182. William Stenson, junior.
1339. Henry Worrall.
1416. William Morgan.
1542. Rudolph Bodmer.
1667. Amable Hippolyte Petit.
1672. Edmund Burke and Alexander Southwood Stocker.
1699. Samuel Lees.
1727. John Hall Brock Thwaites.
1739. Alexander Ogg.
1787. William Kennard.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*A Constant Reader* had better apply to the Secretary of the Admiralty, or the Master-General of the Ordnance.

*G. Bourn.*—Yours is received, and will be inserted.

*T. Dale.*—You had better visit one of the gunboats at Woolwich Dockyard, and see for yourself.



## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

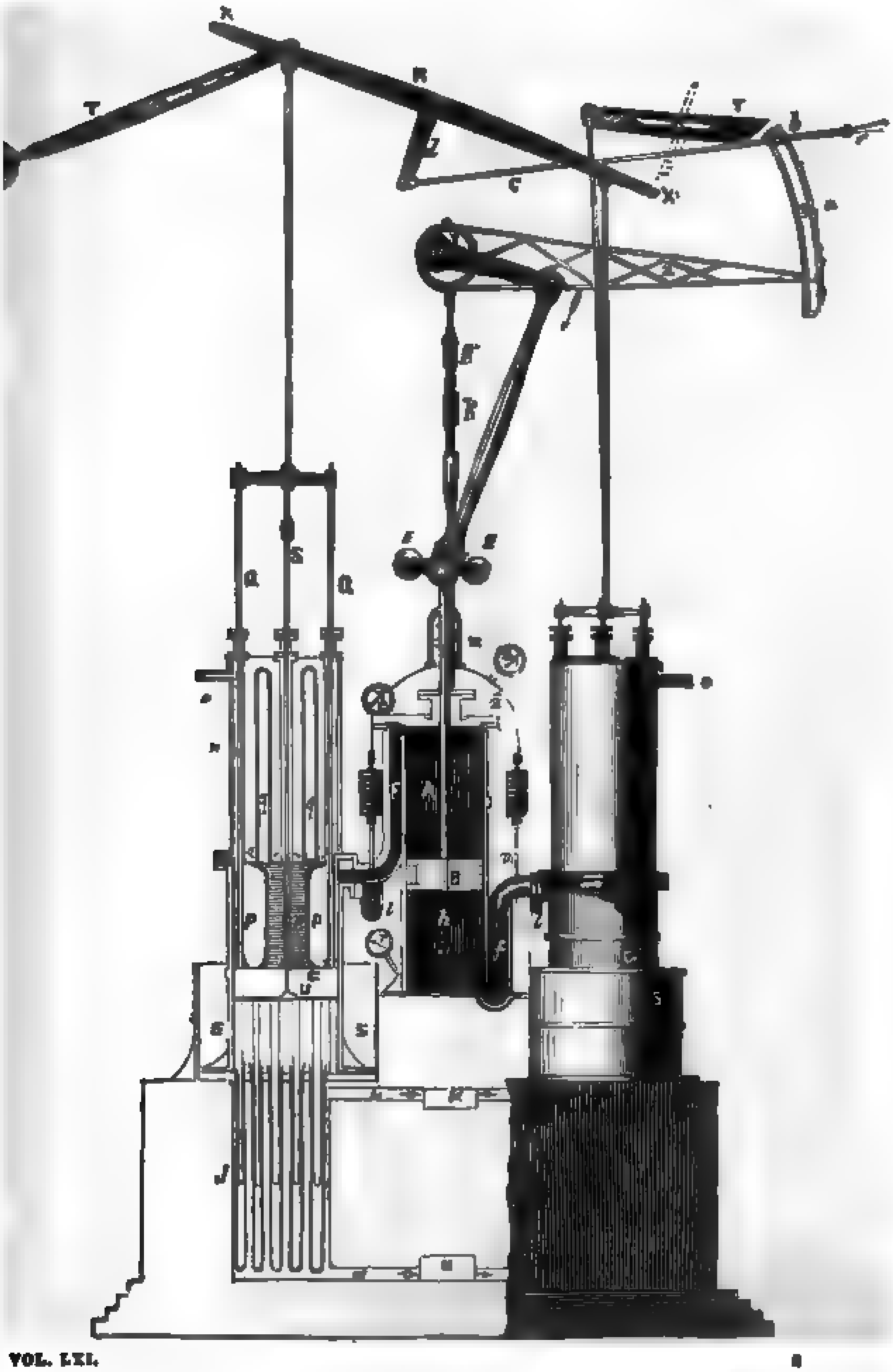
Mechanics' Magazine.

[o. 1628.] SATURDAY, OCTOBER 21, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## NAPIER AND RANKINE'S PATENT HOT-AIR ENGINE.

Fig. 1.



## NAPIER AND RANKINE'S PATENT HOT-AIR ENGINE.

(Patent dated June 9, 1853.)

THE engine we are about to bring before our readers formed the subject of the concluding section of a paper recently read by one of the inventors, Mr. Rankine, before the British Association, at Liverpool.* As this invention has been brought forward as one in which the defects of Ericsson's and Stirling's are avoided, we are anxious to submit it to the judgment of engineers and others, and we hope shortly to have an opportunity of publishing the results of experiments made with an engine constructed upon the principle under the supervision of the patentees.

The arrangement of the different portions of the engine shown in the engraving† is one of many practicable arrangements which the inventors select as being well adapted to display all the essential parts of the engine at one view. It is obvious that the essential parts of the engine, being properly connected with each other, may be arranged in any other way which may be found best suited to the situation in which it is to be used and the work which it is to perform. Fig. 1, represents a vertical section of some portions of the engine, and an elevation of others. Figs. 2, 3, 4, and 5, are plans upon a larger scale of detached portions, to be afterwards more particularly specified.

In fig. 1, A, is a vertical section of a cylinder containing a piston, B, fixed on a piston-rod, C, which traverses a stuffing-box and is connected by means of a connecting-rod with a crank, and gives motion to a shaft, D, on which is a fly-wheel not shown in the engraving. E E are guide rollers for the cross head of the piston-rod.‡ F, is a passage connecting the top of the cylinder with a strong air-tight receiver, G, the body or central part of which is cylindrical, and is shown in section in fig. 1. The uppermost part of this receiver consists of a number of tubes, I, of brass or other suitable metal, open at the bottom, where they are strongly fixed in a plate. These tubes are to be surrounded by water circulating in a tank, H. Their arrangement is shown on an enlarged scale in the plan, fig. 2. Three of those tubes are provided with stuffing-boxes at the top, being intended for the passage of rods to be afterwards described. The remainder are closed at the top, and it is intended that the air or other gas should be cooled in them. The lowest part of the receiver, G, consists of a number of tubes of brass or other suitable metal, arranged in the manner shown on an enlarged scale in the plan, fig. 3, closed at the bottom and open at the top, where they are strongly fixed in a plate. It is intended that the air or other gas should receive heat through them by conduction from the flame from a furnace circulating in a flue, J, around and between the tubes. The plate into which the lower tubes are fixed is protected from the action of the flame by a fire-clay shield. K, is a main flue conducting the flame from a furnace; L, a branch flue leading into the flue or chamber, J; M, a branch flue leading from this chamber to a main flue, N, which conducts the products of combustion to the chimney. P, is a metal plunger divided into compartments, so as to be at once light and strong, as shown on an enlarged scale in the plan, fig. 4. Some of these compartments are to be air-tight, and to be filled with brick dust, fire clay, or some other substance which conducts heat slowly; but one or more compartments are to extend through the plunger, so as to form a passage for air or gas, and are to be filled with a series of layers of wire gauze or thin perforated metal plates, strips, or wires, or of some substance capable of conducting heat rapidly, and so formed and arranged as to expose a large surface for the communication of heat to and from the air which may pass through. One such passage, occupied as described, is represented by $p$ in the section and plan.

The plunger, P, is to be made to fit the body of the receiver, G, as closely as is consistent with its moving up and down with as little friction as may be against the sides of the receiver. It is to be suspended by one or more rods from a beam, R, which moves on a pivot. In the engine shown in the engraving there are two such rods for this plunger, marked Q Q. They work through stuffing-boxes at the top of two of the tubes, I, and are attached to a cross-bar, which is hung from the beam, R, by a rod, and is so formed as to allow a third rod, S, to pass freely through it for a purpose to be afterwards stated. This rod is partly concealed by the former. Another of the tubes, I, is traversed by this rod.

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* See No. for October 7 (1626), page 342.

† The framework by which the working parts of the engine are to be supported is omitted in the engraving, because it involves nothing new or peculiar, and would interfere with the distinct representation of the working parts. Our description is taken from the specification of the patentees, with but little alteration.

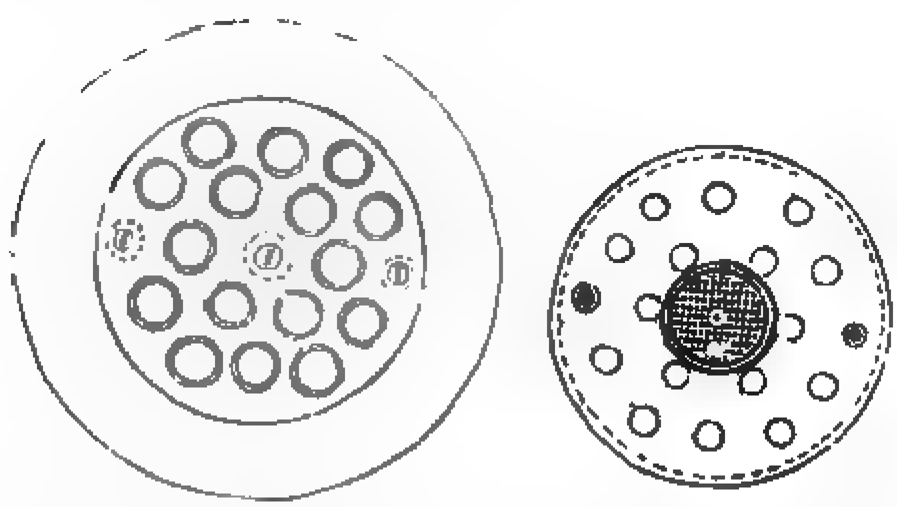
‡ Besides the mode here shown of connecting the piston with the crank, any of the other modes used in steam engines and air engines may be employed.

The tubes not occupied by rods, two of which only are shown in section, are traversed by cylindrical rod-shaped metal plungers, *q*, which, being arranged as shown in the plan, fig. 4, are fixed to the top of the plunger, P, forming part of it, and moving along with it, and fitting the tubes loosely, so as to leave a passage for air or gas all round each tube about an eighth of an inch wide. The rod, S, suspended from the beam, T, works through a stuffing-box at the top of one of the tubes, I, and descending through that tube traverses also the centre of the plunger, P, by a passage wide enough to let it work without friction, and is attached to the heat screen, U.

This heat-screen consists of a circular plate, of iron, brass, or other suitable metal, pierced with holes, fitting the cylindrical part of the receiver, G, but not so tight as to produce friction; and of a series of rod-shaped plungers, of brass, copper, or other suitable metal, fixed to this plate, and moving with it, and capable of filling the tubes in which they work, within about an eighth of an inch all round. This heat-screen is shown in plan on an enlarged scale in fig. 5, where the holes in the plate, U, are indicated by small full circles, the rod-shaped plungers by dotted circles, and the rod, S, by which the heat-screen is suspended, by a dark spot.

The object of the heat-screen * is to regulate the transmission of heat from the flame in the chamber, J, to the air or other gas in the lower part of the receiver, G, so that it shall take place wholly or chiefly during the expansion of this air or other gas, which is the period most favourable for the development of mechanical power, and shall be wholly or almost wholly cut off at other times, when the heat would be wasted, or would impede the action of the engine. The beam, T, from which the heat-screen hangs by the rod, S, moves

Fig. 2. Fig. 4.

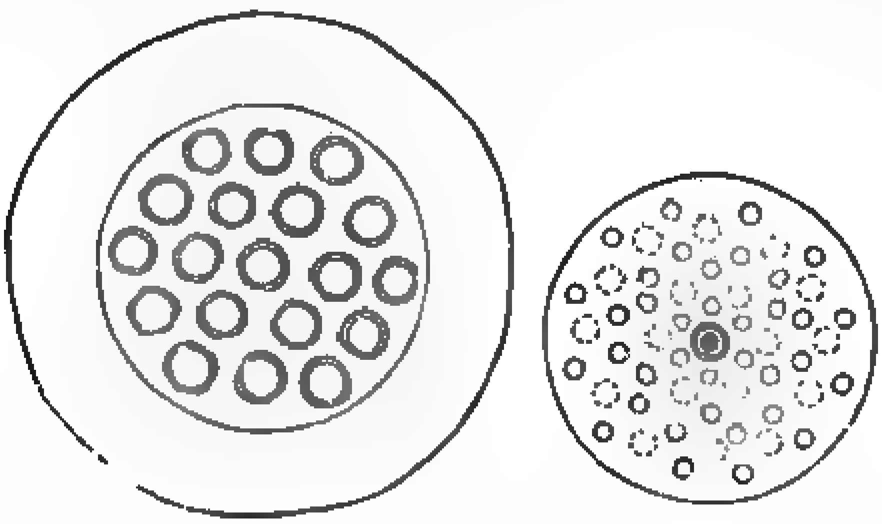


on an axis, and V is a counterpoise to balance wholly or partially the weight of the screen. In stationary engines a preponderance may be allowed to the heat-screen sufficient to make it descend to the bottom of the receiver from the top of its stroke with rapidity, but not with violence. In marine and locomotive engines the balance of weight should be exact, and the descent of the heat-screen should be produced by means of a spring or some other suitable mechanical contrivance. W is a catch turning on a pivot in the beam, T, resting against a stud, and kept in its place by a spring, *x*. The roller, X, at the end of the beam, R, acting on this catch, raises the beam, T, and heat-screen, U, during the latter part of the up stroke of the plunger, P. When the plunger is near the top of its stroke, the catch escapes from the roller, and the heat-screen descends. During the down stroke of the plunger, P, the roller pushes the catch down into a position similar to that shown by dotted lines at W′, and passes it, when the catch springs back to its original position. The counterpoise end of the lever, T′, is omitted, the better to display some other parts of the engine. At the side of fig. 1, towards the left hand, the catch is supposed to have just escaped from the roller, and the heat-screen to be in the act of falling. At the side towards the right hand the heat-screen is supposed to be in its lowest position. Y is an eccentric wheel for working the plungers and heat-screens. By means of the rod, Z, it gives a reciprocating motion to the link, which turns on a pivot at *a*. In this link is fitted

* The form of the heat-screen shown in the engraving is a result of the tubular form of the bottom of the receiver, with which it is made to correspond. Should the bottom of the receiver be made of any other shape, the heat-screen must be made to fit it. In like manner the top of the plunger, P, is to be made to fit the top of the receiver.

a slide, *b*, furnished with a spring catch for fixing it at various notches on the link. This slide is connected by the rod, *c*, with the end of the lever, *d*, which is either part of the beam, R, or fixed to the same axis. Thus a reciprocating motion is communicated from the eccentric to this beam. The handle, *e*, serves to shift the slide, *b*, to various positions in the link. When the slide is in the position shown in the engraving, the shaft, D, will revolve in the direction shown by the arrow; when at the centre of the link the engine will stop; when at the opposite end the motion will be reversed; when in intermediate positions the speed will be moderated. The most economical mode, however, of working at a reduced speed will be to close partially the dampers with which the flues are to be provided, and thus to moderate the combustion in the furnace. The passage, *f*, leads from the lower end of the cylinder to the receiver, G′, which, with its tubes, water-tank, flues, plunger, heat-screen, rods, beams, and other appurtenances, is to be similar to that already described. It is shown in elevation only.

*g* is a rod attached to the eccentric ring for working a forcing-pump, *h*, by which air or the other gas employed is to be compressed into the magazine, *i*, behind the cylinder, both to obtain a sufficient pressure, and to supply the loss by leakage. This forcing pump being behind the cylinder, its position is shown by dotted lines. *k* is an adjusting screw, by which the rod, *g*, can be lengthened or shortened so as to increase or diminish, or altogether to stop the supply of compressed air or gas forced into the magazine at each stroke of the pump. *l l* are pipes leading from the magazine to the passages, communicating with



the two ends of the cylinder respectively, and furnished with valves opening upwards, so that whenever the pressure in either end of the cylinder falls below that in the magazine a supply of air or gas may pass to the end of the cylinder which requires it.

*m*, *m*, *m*, are safety-valves for the two ends of the cylinder, and for the magazine respectively.

Another forcing pump, which needs not be shown, as it presents nothing peculiar, is concealed behind the magazine, and worked by another rod from the eccentric ring. Its function is to supply a stream of cold water to each of the tanks, H H′ which, gradually rising amongst the tubes contained in those tanks, escapes finally by the waste pipes, *o o*, which should be conducted to some convenient outlet. In locomotive and marine engines those tanks should be subdivided by thin perforated partitions to check agitation of the water. Another mode of cooling the tubes is to sprinkle them with water from a number of jets. Communicating with the two ends of the cylinders and with the air magazine respectively, are fixed three pressure guages, *r r r*. They should be capable of indicating pressures up to 200 lbs. on the square inch. *s s* are outer casings for the lower part of the cylindrical body of the receivers, G G′, filled with brick dust, engine ashes, or some other slow conductor of heat. *v v v v* are dampers for the flues.

In the engine shown in the drawing the receivers are vertical, but it is obvious that they might be placed horizontally, the plungers and heat screens being supported on rollers, and the motion of the heat screens towards the hot sides of the receivers being produced by springs or other mechanical contrivances.

Having thus described the parts of the engine, and their connection with each other, it is necessary now to show how it is to be set in motion and worked.

When the engine is at rest, the pressures on the top and bottom of the piston will be equal, and it will place itself nearly in the middle of the cylinder, being the position shown in the drawing. The slide, *b*, being at the middle of the link, *a*, the beams, R, T, and T′,

will all be horizontal, the plungers will be in the middle of their respective receivers, and the heat screens at the bottom. If the fire be now lighted, the flame circulating in the chamber, J, and the corresponding chamber for the other receiver, will heat the lower set of tubes, the rods of the heat screen, and the film of air between them; also the corresponding parts and film of air belonging to the other receiver. At first the greater part of the heat will be accumulated in these bodies, a very small portion only reaching the air above the heat screens. The effect in each receiver being the same, the piston will still be pressed equally on both sides, and will continue at rest.

Suppose the crank to stand, as shown in the engraving, and that it is required to set the engine in motion in the direction indicated by the arrow, the engine man must loosen the spring catch of the slide, *b*, and by means of the handle, *e*, move it to the upper end of the link. This motion will throw the beam, R, into the position shown. It will lower the plunger of the receiver, G', sending the air through the passage in that plunger to the top of the receiver, and into the tubes contained in the tank, H', so that such heat as may have reached it from the flame will be abstracted; at the same time the plunger, P, will be lifted to the top of the receiver, G, sending the air out of the upper tubes, and the superior portion of the body of the receiver down through the passage, P. The heat-screen, U, will also be lifted and dropped, the effect of which will be that the air in the lower part of the receiver will be made to circulate rapidly over the surface of the hot rods, and through the hot lower tubes, and will receive a certain quantity of heat. This heated air expanding will transmit its pressure and its motion through the passage, F, to the air in the cylinder, A, and finally to the piston, B, and the engine will begin to move.

During the working of the engine the following is the succession of changes undergone by the air of the receiver, G;—During the end of the down stroke and beginning of the up stroke of the piston the heat-screen lies at the bottom of the receiver. The plunger, P, descends, and the air, with the exception of a trifling quantity, passes through the passage, *p*, and gives out a large portion of its sensible heat to the wires, strips, or sheets of metal or other conducting bodies contained in that passage. The remainder of the excess of the heat of the air above that of the water in the tank, O', is abstracted by the surface of the upper tubes and the rods, *q*. The up stroke of the piston causes this air to be compressed; this compression produces heat, which is also abstracted by these rods and tubes. This heat, were it not so abstracted, would increase the elasticity of the air, and oppose the motion of the piston. During the end of the up stroke and beginning of the down-stroke the plunger, P, rises, the air descends through the passage, *p*, and recovers the greater part of the sensible heat formerly lost from the wires, or metal sheets, or strips, or other conducting substances. During the first half of the down stroke the heat-screen, *t*, is raised and dropped, and the air, by circulating over its rods, and through the hot lower tubes, acquires the remainder of the sensible heat necessary to elevate its temperature, and also the latent heat necessary to expand it. This completes the cycle of operations in the receiver connected with the upper end of the cylinder. In the other receiver like operations take place, substituting only the up stroke for the down stroke, and *vice versâ*.

## ON SPHEROIDAL NAVIGATION.

BY CHARLES W. MERRIFIELD, ESQ.

The increased accuracy of calculation among sailors, due both to their improved education, and to the more perfect instruments at their command, seems to suggest that, every day, new items, previously rejected as insignificant, should be taken into account in computing a ship's place or course.

The modern introduction of great circle sailing seems naturally to bring under notice the observation, that this method is still but an imperfect one, inasmuch as the earth is not a sphere, but considerably flattened at the poles.

I propose to show that the introduction of this element, of the earth's ellipticity, into the reckoning, increases but little, if at all, the complexity of the ordinary formulæ, and generally by a mere addition or factorial correction. It will be seen, that, in the case of Mercator's sailing, this correction may be entirely included in the tables, so as to leave the formulæ unaltered; and that, in great circle sailing, there are but two principal cases in which a correction will have to be introduced in the solution, and these, too, of a simple kind.

Under these circumstances, I would submit it for consideration to those more familiar than myself with the subject, whether a correction, which gives no additional labour in the day's work, and but little in the determination of the great circle course at the beginning of a voyage, should any longer be neglected.

It is on the compilers of the charts and tables, not on the seamen, that the trouble will fall.

This correction is neither trifling nor uniform. The reduction of latitude is eleven and a half minutes on the parallel of 45°, and diminishes on both sides to nothing at the pole and the equator. In further elucidation, I subjoin a table of the correction of meridional parts, for the earth's ellipticity, applied to two charts now lying before me—the index charts of the Baltic and the Euxine—and of one or two other latitudes for the sake of comparison. I assume the eccentricity to be equal to the sine of 4° 42′, which gives an ellipticity of one in 297·4 nearly:

| | Latitude. | Merid. parts *Mercator.* | Merid. parts *corrected.* | Correction. |
|---|---|---|---|---|
| Baltic Chart. | | | | |
| Highest | 61°·5′. | 4659·55 | 4639·31 | 20·24 |
| Lowest | 53°·10′. | 3780·41 | 3761·96 | 18·45 |
| *Difference* | 7°·55′. | 879·14 | 877·35 | 1·79 |
| Black Sea Chart. | | | | |
| Highest | 47°·20′. | 3232·13 | 3215·14 | 16·99 |
| Lowest | 39°·50′. | 2609·65 | 2594·85 | 14·80 |
| *Difference* | 7°·30′. | 622·48 | 620·29 | 2·19 |
| Parallel of | 7°·30′. | 451·29 | 448·28 | 3·01 |
| Parallel of Greenwich | 51°·28′.36″ | 3614·49 | 3596·40 | 18·09 |
| Pole | 90°·0′. | Infinite. | Infinite. | 23·13 |

In this memorandum I shall confine myself to a bare statement of the formulæ, with the method of obtaining them. To present them in a popular form would be useless, until the tables necessary to their use are computed. I shall use great conciseness, not even entering into discussions of the various cases presented by change of order or of sign; because these can be supplied by any one who is familiar with the rules of great circle sailing and spherical trigonometry.

I shall in all cases keep rigidly to the plan of first investigating or stating the formula, on the supposition that the earth is a sphere, and afterwards proceeding to apply the correction for eccentricity. In many instances this correction is *nil;* in all, it is simple.

I will draw a distinction between the *geographical* mile, or minute of longitude on the equator, and the *nautical* mile, or minute of latitude. It is obvious that, in such a discussion as the present, it is very useful and necessary to have some fixed unit for the *mile*, instead of the varying minute of latitude. My late friend, Colonel Julian Jackson, informed me that the Geographical Society, when he was its secretary, recorded an opinion, that it was advisable to give a fixity of meaning to the *geographical* mile, by confining it to the minute of equatorial longitude.

The lengths of meridians on Mercator's chart are determined as follows:—

Suppose $a$ to be the equatorial radius.
$p$ radius of parallel.
H the portion of meridian intercepted between the parallel and the equator.
$\mu$ the same meridional length in the projection.
$\phi$ the nautical latitude; that is, the angle which the normal makes with the plane of the equator.

The condition that the curve, crossing all the meridians at a constant angle, should be projected as a straight line, gives—

$$a : d\mu :: p : d\mathrm{H}, \text{ or } \mu = a\int\frac{d\mathrm{H}}{p}.$$

Mercator considered the earth as a sphere. On this supposition $\mathrm{H}=a\phi$, and $p=a\cos.\phi$, and therefore

$$\frac{\mu}{a}=\int\frac{d\phi}{\cos.\phi}=\text{hyp. log. tan.}\left(\frac{\pi}{4}+\frac{\phi}{2}\right)$$

If the geographical mile be taken for unity, and therefore $a=3437{\cdot}74677$, this formula gives the common table of meridional parts.

But let us suppose the earth to be a spheroid, with an eccentricity $\epsilon$. We now have, referring the ellipse of the meridian to its tangent,

$$p = \frac{a \cos. \phi}{\sqrt{1-\epsilon^2 \sin.^2 \phi}}, \quad \frac{d\mathrm{H}}{d\phi} = \frac{a(1-\epsilon^2)}{(1-\epsilon^2 \sin.^2 \phi)^{\frac{3}{2}}};$$

$$\therefore \mu = a\int \frac{d\mathrm{H}}{p} = a(1-\epsilon^2)\int \frac{d\phi}{\cos. \phi\,(1-\epsilon^2 \sin.^2 \phi)},$$

$$= a\int \frac{d\phi}{\cos. \phi} - a\epsilon^2 \int \frac{\cos. \phi\, d\phi}{1-\epsilon^2 \sin.^2 \phi},$$

$$\frac{\mu}{a} = \tfrac{1}{2} \text{ hyp. log. } \frac{1+\sin. \phi}{1-\sin. \phi} - \frac{\epsilon}{2} \text{ hyp. log. } \frac{1+\epsilon \sin. \phi}{1-\epsilon \sin. \phi}.$$

If we take an auxiliary angle $\omega$, such that $\sin. \omega = \epsilon \sin. \phi$, this becomes

$$\frac{\mu}{a} = \text{hyp. log. tan.} \left(\frac{\pi}{4}+\frac{\phi}{2}\right) - \epsilon \times \text{hyp. log. tan.} \left(\frac{\pi}{4}+\frac{\omega}{2}\right).$$

The subtractive part of the second side of these equations may be called the correction for ellipticity. It may be computed by the help of the auxiliary angle, but more easily by expanding it into the series,

$$\epsilon \left( \epsilon \sin. \phi + \frac{\epsilon^3 \sin.^3 \phi}{3} + \frac{\epsilon^5 \sin.^5 \phi}{5} + \ldots . \right)$$

of which the law is obvious.

If $\rho$ be the length on the rhumb for the course $\chi$, and $\lambda$ the difference of longitude between a given point and the place where the rhumb crosses the equator, we have, on the supposition that the earth is a sphere,

Cos. $\phi\, d\lambda = \tan. \chi\, d\phi$, and $d\rho = \sec. \chi\, d\phi$,

$$\text{whence } \lambda = \tan. \chi. \text{ hyp. log. tan. } \left(\frac{\pi}{4}+\frac{\phi}{2}\right), \text{ and } \rho = \phi \sec. \chi.$$

But if the earth be spheroidal, we have

$$\frac{\cos. \phi\, d\lambda}{\sqrt{1-\epsilon^2 \sin.^2\phi}} = \frac{(1-\epsilon^2)\tan. \chi\, d\phi}{(1-\epsilon^2 \sin.^2 \phi)^{\frac{3}{2}}}, \text{ and}$$

$$\lambda = (1-\epsilon^2) \tan. \chi \int \frac{d\phi}{\cos. \phi\,(1-\epsilon^2 \sin.^2\phi)}$$

$$= \tan. \chi \left\{ \text{log. tan. } \left(\frac{\pi}{4}+\frac{\phi}{2}\right) - \epsilon \text{ log. tan. } \left(\frac{\pi}{4}+\frac{\omega}{2}\right)\right\}$$

where, as before, $\sin. \omega = \epsilon \sin. \phi$.

$$\text{Also } d\rho = \sec. \chi\, d\mathrm{H} = \frac{(1-\epsilon^2) \sec. \chi\, d\phi}{(1-\epsilon^2 \sin.^2 \phi)^{\frac{3}{2}}},$$

$$\text{Whence } \rho = (1-\epsilon^2) \sec. \chi \int \frac{d\phi}{(1-\epsilon^2 \sin.^2 \phi)^{\frac{3}{2}}}$$

$$= \sec. \chi \int \sqrt{1-\epsilon^2 \sin.^2 \phi}\; d\phi - \frac{\epsilon^2 \sec. \chi \sin. 2\phi}{2\sqrt{1-\epsilon^2 \sin.^2 \phi}} \text{ * }.$$

Legendre has tabulated the integral $\int d\phi \sqrt{1-\epsilon^2 \sin.^2 \phi}$, which is called an elliptic function of the second kind. His table is not convenient for our purpose, and it would be better to tabulate $\int \frac{(1-\epsilon^2)\, d\phi}{(1-\epsilon^2 \sin.^2 \phi)^{\frac{3}{2}}}$, and its logarithm, to the radius expressed in minutes, as well as to radius unity.

In the present state of mathematical science, the actual *geodetic line* (as Legendre calls the line of shortest distance between two points on the surface of a spheroid) is not practically available for common purposes, not from the complexity of its investigation, or computation, but because it cannot be tabulated in any available shape. It is discussed by

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* The difference $\frac{\epsilon^2 \sin. 2\phi}{2\sqrt{1-\epsilon^2 \sin.^2 \phi}}$, between the two last-mentioned integrals, or elliptic arcs, is equal to the perpendicular, from the centre of the ellipse, on the normal making with the axis major an angle equal to $\phi$.

Legendre in his "Théorie des Fonctions Elliptiques," vol. i. p. 360. It lies generally in a higher latitude than the great circle course, which, again, lies in a higher latitude than the rhumb.

I shall define a great circle on the spheroid to be the curve of intersection of its surface with a plane passing through the centre. If $\phi$ be the latitude of its highest point, or vertex, at which it is a tangent to the parallel of latitude, it is called the prime vertical of $\phi$. It is always an ellipse, of which the major axis is the equatorial diameter, and the eccentricity $\frac{\epsilon\sqrt{1-\epsilon^2}\sin.\phi}{\sqrt{1-\epsilon^2\sin.^2\phi}}$.

I now proceed to consider the means of projecting this great circle (so called) on Mercator's chart. I shall in the first place assume that the highest point $\phi$ is known. Then all we have to find is the latitude $\theta$, at which the prime vertical cuts a meridian, making at the pole an angle $\lambda$ with the given meridian.

Supposing the earth to be spherical, we have, by the ordinary rule for right-angled triangles,

$$\tan.\theta=\tan.\phi\cos.\lambda$$

It is remarkable that this formula holds, without variation, for a spheroid. This may be shown as follows—noting that $\tan.^2\phi=\frac{a^2-p^2}{(1-\epsilon^2)p^2}$.

The projection of the prime vertical on the plane of the equator is an ellipse, of which $a$ is the major, and $p$ the minor, semiaxis. If $r$ be its radius vector from the centre, $r^2=\frac{a^2p^2}{a^2-(a^2-p^2)\sin.^2\lambda}$. Now, since $r$ is equal to the radius of the parallel of $\theta$,

$$\tan.^2\theta=\frac{a^2-r^2}{(1-\epsilon^2)r^2}=\frac{a^2-(a^2-p^2)\sin.^2\lambda-p^2}{(1-\epsilon^2)p^2}$$

$$=\frac{(a^2-p^2)\cos.^2\lambda}{(1-\epsilon^2)p^2}=\tan.^2\phi\cos.^2\lambda;$$

and, therefore, as before, $\tan.\theta=\tan.\phi\cos.\lambda$.

It must be borne in mind that $\phi$ and $\theta$ are angles of *nautical* latitude of the spheroid and not the angles subtended from the centre, or *geocentric* latitudes. In the case of the sphere, the distinction is immaterial.

I have still to show how to draw a great circle on the spheroid through any two given points, and how to find the course and distance at any point.

Let the latitudes of the points be $\theta$ and $(\theta)$, and their difference of longitude $\delta$. Assume $x$ and $(x)$ to be the distances in longitude from the meridian passing through the vertex of the great circle. I shall, for the sake of simplicity, also assume that both the given points are on the same side of the equator, and that the vertex falls between them. In other cases, an appropriate change of sign may have to be made.

We have for the determination of $x$, $(x)$, and $\phi$, the three equations,

$$x+(x)=\delta,$$

$$\tan.\theta=\tan.\phi\cos.x,\qquad \tan.(\theta)=\tan\phi\cos.(x).$$

Hence,

$$\tan.(\theta)=\tan.\phi\cos.(\delta-x)$$

$$=\tan.\phi\cos.\delta\cos.x+\tan.\phi\sin.\delta\sin.x$$

$$=\tan.\theta\cos.\delta+\tan.\theta\sin.\delta\tan.x.$$

$$\therefore\tan.x=\frac{\tan.(\theta)-\tan.\theta\cos.\delta}{\tan.\theta\sin.\delta}=\frac{\tan.(\theta)}{\tan.\theta\sin.\delta}-\cot.\delta;$$

$$\text{Similarly }\tan.(x)=\frac{\tan.\theta-\tan.(\theta)\cos.\delta}{\tan.(\theta)\sin.\delta}=\frac{\tan.\theta}{\tan.(\theta)\sin.\delta}-\cot.\delta$$

These equations give $x$ and $(x)$, and from either of them $\phi$, and the other, may be easily found. It is obvious that these equations are not affected by the eccentricity.

Supposing the earth to be spherical, and $\chi$ the course at the point $\theta$, we have, by the ordinary rule for right-angled spherical triangles, $\cos.\phi=\cos.\theta\sin.\chi$ and

$$\cos.\chi=\sin.\lambda\sin.\phi,\text{ whence }\tan.\chi=\frac{\cot.\phi}{\cos.\theta\sin.\lambda}.$$

Also, if $\psi$ be the angle subtended at the centre by the arc of the prime vertical between the equator and the given point, $\cos.\psi=\sin.\lambda\cos.\theta=\cot.\phi\cot.\chi$.

For the spheroid these formulæ become

$$\cos.\psi=\sin.\lambda\cos.\theta'\text{ and }\cos.\chi=\frac{\sin.\lambda\sin.\phi'}{\cos.(\theta-\theta')},$$

the dashed letters meaning angles of *geocentric* latitude.

The second formula is obtained by transferring the bearings to the tangent plane by the solution of another right-angled spherical triangle. Where extreme exactness is not required, the angle $\psi$ may be turned into minutes, and these taken as miles. For all ordinary purposes, this is a sufficient approximation.

The actual distance, measured along the great circle, between the vertex and the point whose latitude is $\theta$, depends on the integral

$$V = a\sqrt{1-k^2}\int\frac{(1-2k^2\cos.^2\psi+k^4\cos.^2\psi)^{\frac{1}{2}}}{(1-k^2\cos.^2\psi)^{\frac{3}{2}}}\,d\psi.$$

This integral, I need hardly say, will require to be tabulated. If we neglect, as insignificant, the eighth and all higher powers of $k$, we may obtain the approximate equation

$$\frac{V}{a\sqrt{1-k^2}} = \int\frac{d\psi}{\sqrt{1-k^2\cos.^2\psi}} + \frac{k^4}{64}(4+5k^2)\left(\psi-\frac{\sin.4\psi}{4}\right)+\frac{5k^6}{192}(\sin.2\psi)^3.$$

It is thus made to depend on the integral $\int\frac{d\phi}{\sqrt{1-k^2\sin.^2\phi}}$, which is called an elliptic function of the first kind, and has been tabulated by Legendre in the work above cited. To that work I must refer those who desire to be acquainted with the best methods of computing tables of the integrals depending on the ellipse.

Only four new tables will require to be computed for this method:

I. A new table of meridional parts.

II. A more extensive table for the comparison of geocentric with nautical latitude—to every tenth minute, at least.

III. The lengths of degrees of latitude, and the meridional distance of their parallels from the equator, both to radius unity and in geographical miles, with logarithms. This table should contain a column for the lengths of degrees of longitude, and for log. $\sqrt{1-\epsilon^2\sin.^2\phi}$. It would be sufficient to compute it to intervals of half a degree.

IV. A table of actual distances from the vertex, in geographical miles, to each geocentric degree on various prime verticals—say the prime verticals to every five degrees of nautical latitude.

The computation of these tables, especially of the last, will be somewhat laborious. This, however, is a small matter, where increased accuracy and facility are to be gained in the common calculations of seamen.

Privy Council Office, October, 1854.

## THE NAVIGATION OF IRON SHIPS.

In his paper, read before the British Association on this subject, Dr. Scoresby observed, that since the first promulgation of his views at the British Association in Oxford, in 1847, he had to contend with either the *denial* or *non-reception* of them from the principal body of scientific men engaged in the consideration of compass adjustment and compass action in iron ships. But it was now most gratifying to find, from the paper of Mr. Archibald Smith, a gentleman eminent as a mathematician, and having all the records of Her Majesty's ships, as to compasses, at command, that every essential principle for which he contended, as to the principles which affect the development, destruction, and changes in the magnetism of iron ships, is admitted and supported. These principles, so supported by Mr. Smith, might be thus enumerated:—1. That the magnetism of iron ships in its action on the compass, may be represented by a vertical and a horizontal iron or magnetic bar swinging round a compass; a mode of illustration which he, Mr. Smith, had adopted some years ago, and described in lectures, as well as in his publication of 1851. 2. That changes in the magnetic distribution and compass action in iron ships, which he predicted, do take place. 3. That the changes take place in a ship's magnetism by change of magnetic latitude, a fact inferred from the Admiralty observations which his (Dr. Scoresby's) experiments satisfactorily elucidated as a necessary correspondence of the resistance in iron to change in regard to the denomination of *retentive* magnetism. 4. That there are influences in a ship derived from the varieties of form and position (relatively to the compass) of particular masses of iron, which may act as *natural correctives*. 5. That the plan of correcting the duration of iron ships by *fixed magnets* (unless in places or limited voyages) is unsafe, and in going to southern regions aggravates the error. 6. That the twisting of the iron materials of a ship will tend, especially in

ships recently launched, to alter the magnetic action on the compass. 7. That it requires time to effect the changes in a ship's magnetic distribution, which ultimately may, in regions distant from the place of building, be effected. And the whole of the results plainly go, he believed, to the establishment of a proposition, of the accuracy of which he has long endeavoured to convince those interested in the navigation of iron ships, that the magnetism of such ships is, in all its qualities, changeable; the most enduring, or apparently fixed, which he has denominated *retentive magnetism*, being of a description changeable under severe straining and mechanical violence. No large changes may be expected under the following circumstances:—1. In iron ships long in use, and ordinarily pursuing the same voyage, because extreme distribution gets shaken down, as it were, in a medium or average state. 2. Great changes do not take place in the retentive magnetism (by far the greater portion) in latitudes not farther south than the Mediterranean, because, 3, in ships trading in the Channels, or east and west to America, the liability to new or unexpected changes greatly diminishes. In such cases, an intelligent captain, observing the changes, duration, alteration, and allowances, may generally run with great confidence. Experience will establish the effect of circumstances in this case. Suggestions:—1. A standard-azimuth compass to be placed on a high pedestal, where (on the Admiralty plan) a position of small duration may be found. 2. A compass at masthead he believed best of all for reference, by which the great body of error will be demonstrated. 3. The wheel-compass required for ships engaged in the home-trade, or traversing mainly parallels of latitude not southward of the Mediterranean, if adjusted with magnets and pieces of iron, may not be then unsafe, where reference may always be had to the standard for verification. 4. No standard compass in great distances. 5. Care in selection of compasses, to have ample directive force. His improvements had trebled the directive force, weight for weight, of the compasses used in the Navy up to 1839 or 1840. 6. Captains must be made to take observations for verifying their compasses by azimuth compasses, stars, position of land—a subject of examination. 7. Captains should have a special knowledge for the charge of iron ships, for here, in addition to the ordinary dangers of navigation, is a new source of error and misguidance, as to which, it is most important, he should never be thrown off his guard. 8. Rules of caution.

## PHILLIPS'S LIQUID PURIFIER.

In a preceding Number (1620) we gave notice of an improvement in the manufacture of metals, &c., which had been effected by Mr. Phillips, of Kennington. We are now in a position to state the results of certain experiments which were conducted at the Royal Dockyard, Woolwich, with the sanction of the Lords of the Admiralty, under the supervision of Mr. Atherton, the chief engineer of that establishment. The first set of trials, which were made with bars 1 inch square, and 20 inches long, cast from half old and half new iron, resulted as follows:

TABLE I.

| No. of Experiment. | Longitudinal strain at the moment of breaking, in tons. | | Transverse strain at the moment of breaking, in cwts.: supports 18 ins. apart. | | State of the section of the metal at the fracture. |
|---|---|---|---|---|---|
| | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. | |
| 1 | 3 | .... | .... | .... | Defective. |
| 2 | $3\frac{1}{4}$ | .... | .... | .... | Defective. |
| 3 | $4\frac{1}{4}$ | .... | .... | .... | Defective. |
| 4 | .... | $5\frac{1}{4}$ | .... | .... | Sound. |
| 5 | .... | $5\frac{1}{8}$ | .... | .... | Sound. |
| 6 | .... | $5\frac{3}{8}$ | .... | .... | Sound. |
| 7 | .... | .... | $16\frac{3}{4}$ | .... | Sound. |
| 8 | .... | .... | 14 | .... | Sound. |
| 9 | .... | .... | $17\frac{1}{4}$ | .... | Sound. |
| 10 | .... | .... | .... | 13 | Sound. |
| 11 | .... | .... | .... | $15\frac{1}{4}$ | Sound. |
| 12 | .... | .... | .... | $16\frac{1}{12}$ | Sound. |

In consequence of the irregular variations observable in the above results, and the defectiveness of the first three bars, and of them only, it was considered necessary that a second series of trials should be conducted, before the Admiralty Report upon the subject was prepared. Other experiments were therefore made with bars of similar metal, looped at their extremities, and 1¼ inches square at the middle of their length. These gave the following results:

TABLE II.

| No. of Experiment. | Longitudinal Strain at the moment of breaking, in tons. | | Transverse strain at the moment of breaking in cwts: supports 3ft. apart. | | State of the section of the metal at the fracture. |
|---|---|---|---|---|---|
| | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. | |
| 1 | 15¼ | .... | .... | .... | Defective. |
| 2 | 18¾ | .... | .... | .... | Defective. |
| 3 | 22¾ | .... | .... | .... | Sound. |
| 4 | .... | 15¼ | .... | .... | Defective. |
| 5 | .... | 14 | .... | .... | Defective. |
| 6 | .... | 22¼ | .... | .... | Defective. |
| 7 | .... | .... | 12¼ | .... | Defective. |
| 8 | .... | .... | 13 | .... | Sound. |
| 9 | .... | .... | 13⅛ | .... | Sound. |
| 10 | .... | .... | 13⅝ | .... | Sound. |
| 11 | .... | .... | 13¾ | .... | Sound. |
| 12 | .... | .... | 12½ | .... | Defective. |
| 13 | .... | .... | .... | 12½ | Sound. |
| 14 | .... | .... | .... | 13⅞ | Sound. |
| 15 | .... | .... | .... | 9½ | Defective. |
| 16 | .... | .... | .... | 12¾ | Sound. |
| 17 | .... | .... | .... | 13 | Defective. |
| 18 | .... | .... | .... | 11½ | Defective. |

We must leave our readers to draw from these Tables their own conclusions respecting the merits of Mr. Phillips's invention; but we may here observe, that we think it would be highly injudicious to look upon the above experiments as final, or sufficient, when the importance of the invention in question is considered. It may, however, save trouble if we compare the results by tabulating the totals thus:

TABLE III.

| | 1st Set of Trials. | | 2nd Set of Trials. | |
|---|---|---|---|---|
| | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. | With Mr. Phillips's Purifier. | Without Mr. Phillips's Purifier. |
| Sum of cohesive stengths in tons. | 10½ | 16½ | 56¾ | 51½ |
| Sum of transverse strengths in cwt. | 48 | 44⅛ | 78¼ | 73⅛ |

## MINOTTO'S SYSTEM OF GEARING FOR MACHINERY.

M. Minotto, Vice-director of Telegraphs in Piedmont, recently presented to the Society for the Encouragement of National Industry, Paris, models and a description of a system of *wedge-gearing*, which is intended to be substituted, in many instances, for the common-toothed wheels. The following is an extract from the report of a committee of the above society upon the subject, which has appeared in several of the French journals.

Everybody knows the properties of the wedge to multiply upon its lateral faces the force applied upon its back in proportion to

the angle, so that in an isosceles wedge the force exerted on either face is to the force applied on the back as the height of the wedge to one-half of its breadth. Upon this property M. Minotto depends to increase the adhesion of wheels, without increasing the pressure on their axes in the same proportion. Thus, if it be required to drive two parallel axes by the contact of two pulleys mounted upon them, we know that it is necessary to press strongly, in order to prevent slipping, whenever the forces to be transmitted are at all powerful, and in consequence to cause considerable friction on the axes. The same thing will not take place if a groove be turned on the

Fig. 1. Fig. 2.

outer face of one of the pulleys, and the face of the other be of conical form, so that it may enter partially in the groove of the former (fig. 1). All the properties of the wedge re-appear here; that is to say, in consequence of the greater or less acuteness of the angle of the groove and its corresponding projection on the other wheel, the section of which presents a truncated cone, a small pressure on the axis may cause a very great pressure at the contact, and thus an adherence, by means of which one wheel will drive the other, overcoming the resistance which opposes its motion.

This is the principle of the system. Let us endeavour to explain the advantages of its use.

*Of the slipping.*—The most remarkable character of this system of gearing is, that a slipping may take place from a change in the forces. This property, which renders it improper to replace toothed wheels in systems where these are intended to assure certain rates of motion, as in horological apparatus, makes it, on the contrary, extremely valuable for applications where the resistance may undergo considerable changes, which is a continued cause of fracture of toothed wheels. This resemblance with the system known under the name of *friction-cones*, ought to be carefully observed, and constitutes an important property of the new system.

*Of the friction.*—It seems that the sliding friction which is exerted on the faces in contact, especially beyond the primitive circumferences, ought to be a cause of inferiority of this system; but it is to be remarked that, in the momentary rubbing of the surfaces of contact around the mean point which defines the primitive circumferences, the parts further from this point wear out much faster than those which only roll, and, consequently, the face of the wedge has a disposition to take a convex form, which tends to reduce very much the value of the friction (fig. 2). According to the calculation, the new system will offer a notable superiority over the toothed gearing, whenever the angle at the apex of the wedge is below 20°. Moreover, the inventor demonstrates the greasing, which much diminishes the friction, has but little influence upon the adhesion of contact, which is explained by the almost complete expulsion of the lubric at the point at which the greatest pressure is exerted.

*Of the wear.*—The rapidity of wear in this system of gearing, and consequently the necessity of a gradual approximation of the axes, so as to always proportion the pressure and adhesion to the resistance to be surmounted, appear to be the most prominent obstacles to the adoption of this system for large machines, although this approximation is often easy to obtain. As to the wear itself, although the author has made experiments which lead him to believe that it is very slight, yet it appears to us to be the weak point of the system, whenever it is not possible to multiply the number of wheels placed upon the two axes, which the lathe permits to be easily executed; so that, as the pressure on each point of contact may be always much less than that at which the destruction of the metal is rapid, this system may be employed for a long time, provided the axes can from time to time be brought nearer, and the conical groove be deep enough to work with a considerable wear.

We will enumerate here the arrangements contrived by M. Minotto to avoid and remedy the wear; first, the greasing to avoid jamming; secondly, the use of discs forming the wheels when united by means of bolts, wheels whose thicknesses may be varied by changing the block interposed between the disks.

*Applications.*—The system of wedge-gearing may produce not only motions of rotation, but also rectilinear motions by

arrangements analogous to racks, cams, &c. M. Minotto proposes two applications, the one to rectilinear, the other to rotary motions, which we will here indicate.

One of these applications relates to railroads, and consists in the use of a grooved wheel, gearing upon a bar of iron placed in the middle of the track to increase the adhesion of locomotives in the ascent of high grades. The other employment which M. Minotto recommends consists in the employment of the wedge-gearing for the transmission of the rotary motion to the large main axes of propeller steamships, which must move rapidly to operate usefully upon the liquid.

## THE HYDROSTATICAL INQUIRY.

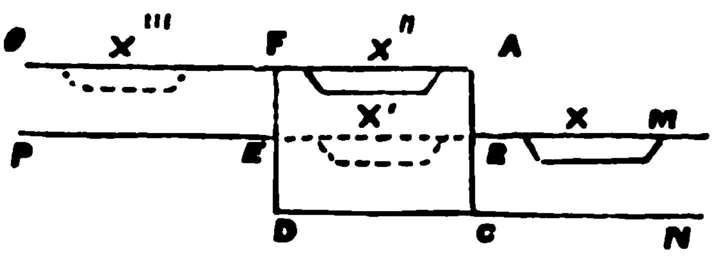
(*Ante*, pages 351, 373.)

*To the Editor of the Mechanics' Magazine.*

SIR,—I am much obliged to your correspondents for the attention they have paid to my inquiry. The following is my own view of the matter, and may serve to correct a slight inaccuracy which appears to have crept into the close of Mr. Baddeley's letter.

Case I. When going up the locks.

1. In the accompanying diagram, when




the boat, X, of 50 tons arrives at X′ in the lock, ACDF, it pushes 50 tons of water out of the portion EBCD of the lock into the canal, BCMN. The gate, ABC, is then closed, and the boat is raised to X′′ by water from the upper portion, FOPE. When the boat is floated through to X′′′, fifty tons of water rush into the portion, ABEF of the lock. The gate, FED, is then closed, and the boat moves on. Hence, 50 tons of water have been required from the upper portion, FEOP of the canal, *besides the tons in the capacity of the portion*, ABEF, *of the lock*, in order to float the boat, X, to the position X′′′.

2. For the cork we have no displacement on entering, nor any on leaving the lock, ACDF; and hence the tons in the capacity of the portion, ABEF of the lock is all the water required to float the cork through the locks. The boat, therefore, requires 50 tons more water from the upper portion of the canal than the cork in passing up the locks.

Case II. When going down the locks.

1. When the boat, X′′′ arrives at X′′, it pushes 50 tons of water out of the portion, ABEF of the lock into the upper portion, FEOP of the canal. The gate, FED, is then closed, and the boat is lowered to X′. The gate, ABC, is then opened, and the boat floats to X, when 50 tons of water rush into the portion BCDE of the lock ACDF, from the lower portion BCMN of the canal. Hence, 50 tons of water, *less than the number of tons in the capacity of the portion*, ABEF *of the lock*, have been required from the upper portion of the canal to float the boat from X′′′ to X.

2. In the case of the cork there is no displacement on its successively arriving at X′′ and X: when a quantity of water equal to the number of tons in the capacity of the portion, ABEF, has been required in lowering it to X.

The boat, therefore, requires less water from the upper portion of the canal than the cork in passing down the locks.

Your readers will observe, that I have only considered the case of one lock; but since the result is the same for any number of locks, the preceding may suffice as an answer to the question.

I remain, yours, &c.,

T. T. W.

Burnley, Oct. 14, 1854.

## ON WATER AS A CONDUCTOR OF ELECTRIC CURRENTS.

*To the Editor of the Mechanics' Magazine.*

SIR,—In reply to Mr. Baddeley's letter in your last Number: electricity is *free* directly it leaves the conductor (as a telegraphic wire) confining it, and enters the earth.

During the action of an electrical current upon an insulated conductor, a *transmission* of the sensation takes place in the conductor; the coils by which magnets are deflected, or the fuses by which cannons are fired, form portions of the conductor.

But immediately that it passes away from the control of a conductor into the body of the earth it is *absorbed*.

If Mr. Baddeley doubts what he terms my *ipse dixit*, in reference to the exceedingly bad conducting power of water, I can only say, that Cavendish's investigations in the matter have been abundantly confirmed; and a simple experiment, with an ordinary galvanometer and a tube of water, will satisfy anybody that pipes of water can never be of the least practical use as electro-telegraphic conductors.

I shall not again trespass on your columns on this subject. Those who are accustomed to experimentalize with telegraphic wires

are well aware of the phenomena I have referred to in my former letters, and I shall at any time be happy to show Mr. Baddeley by actual experiment on a thousand miles of wire, that my statement as to the comparative resistance of a yard of water of equal diameter is correct.

I am, Sir, yours most obediently,

CHARLES T. BRIGHT.

Liverpool, Oct. 14, 1854.

## DIVERS' DRESSES FOR SUBMARINE OPERATIONS.

*To the Editor of the Mechanics' Magazine.*

SIR,—I have long entertained the idea that an important improvement might be effected in the dress of the diver engaged in submarine operations, and I deem the present time (when the services of the diver are so much in request) favourable for communicating to you my idea on the subject.

When the diver is now employed under water, he is supplied with air by means of an air-pump; the pressure of the air thus forced within his helmet must always exceed the pressure of the element in which he is immersed, and the air supplied in excess of that required for filling the helmet escapes at its lower edge; the compressed air within the helmet (partially vitiated by the exhaled breath of the diver) exerts itself in so oppressive a manner upon his lungs and brain, that but few men can descend and labour at a great depth under water, even for a short period.

To obviate this difficulty, I propose that a perfectly air-tight dress be made in two parts only, each part being riveted to a metallic band furnished with a projecting flange, the lower part of this dress covering the feet and legs, and reaching to the waist; the upper part firmly riveted to the helmet, and extending downwards as far as the waist, where the two parts should be united by means of the two metallic bands, having a layer of leather or vulcanised India rubber between the flanges, and forcibly drawn together with nuts and screws, so as to render the joint water-tight. This dress should be constructed so as to be flexible, and yet of sufficient strength to protect the chest and abdomen of the diver from the pressure of the superincumbent fluid, the diver's hands being either encased or allowed to project from the extremities of the sleeves of the dress, the cuffs (of vulcanised India rubber) being tightly bound round the diver's wrists. The diver, being thus perfectly secure from the ingress of water within his dress, and being weighted sufficiently to enable him to descend, he should be supplied with air in the following manner:

A strong flexible tube, or hose, of about $1\frac{1}{2}$ inches in diameter (having within it a similar tube of about half an inch in diameter, and of length rather more than sufficient to reach from the surface of the water to the lowest depth to which the diver would descend), should be screwed on to the top of the helmet; the end of the inner small tube, fitted to an ivory mouth-piece, extending within the helmet far enough to allow of its being taken into the mouth of the diver. By this arrangement, a supply of fresh air could be inhaled, through the small tube, by the mouth and lungs of the diver, and exhaled through his nostrils, the exhaled breath escaping, through the large tube, to its open end at the surface. By this method the diver would always breathe pure air at the ordinary atmospheric pressure, the use of the force-pump (which requires a great amount of labour) would be dispensed with, and the diver would be enabled to carry on his operations for a longer period, and with less inconvenience to himself, than according to the present mode.

I am, Sir, yours, &c.,

EDWARD COCKS.

135, High-street, Southampton.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

LORET-VERMEERSCH, FRANÇOIS, of Malines, Belgium. *Improvements in looms for weaving.* Patent dated March 20, 1854. (No. 656.)

The patentee describes several elaborate improvements, the principal feature of which consists in the use of a certain cylinder by which the alternations in the rise and fall of the heddles are effected.

HORTON, JOSEPH, of Shoreditch, boiler maker, and RICHARD JENKIN POLGLASE, of Stepney, Middlesex, engineer. *Improvements in the construction of ships' boilers, girders, tanks, gas-meters, and other like structures or vessels.* Patent dated March 20, 1854. (No. 657.)

This invention consists in preparing and employing iron plates of the form which is obtained by cutting away one-fourth of the area of an ordinary rectangular plate from one of its corners, the lines which form the edges of the portion cut away passing through the centre of the original plate, and being parallel to its sides.

CHENOT, CLAUDE ADRIEN BERNARD, of Paris, France. *Improvements in the manufacture of steel, iron, and different alloys, cast, welded, and moulded.* Patent dated March 20, 1854. (No. 658.)

*Claims.*—1. "A system of machinery which I call 'Electric Sorting Machine,' the novelty in said machine being the use of electro magnets for sorting, enriching, and purifying mineral matters. 2. Different systems of reducing ores into metallic sponges by any reducing agent, and especially by pure oxyd of carbon obtained from the pure carbonic acid, as resulting from the reduction. 3. The pulverization of the sponge. 4. The thorough mixture of the sponge with different bodies before or after said pulverization, for the purpose of obtaining different combinations or alloys of metals, this mixing process being especially intended to be applied instead of the usual cementing process, thus substituting a cold process, which lasts several minutes, for a hot one, which lasts several weeks."

LONGBOTTOM, JOHN, of Merrion-street, Leeds, York, engineer. *Improvements in combining atmospheric air with hydro-carbons for the purposes of light and heat.* (A communication.) Patent dated March 20, 1854. (No. 660.)

"This invention consists in causing atmospheric air, which is to be combined with hydro-carbons, for the purpose of light and heat, to be passed in contact with pumice-stone, or other porous substance, saturated with caustic potash, and then to be passed in contact with pumice-stone or other porous substance or material, saturated with sulphuric acid, in order to free the air from water; the dry and pure air is then passed in contact with the hydrocarbon to be used, which, combining with the air, produces a compound suitable to be used in place of gas."

PERKINS, JOSEPH, of Kennington, Surrey, architectural modeller. *Improvements in metallurgy, especially applicable to the production of type and ornamental forms.* Patent dated March 20, 1854. (No. 661.)

The patentee says, "I am enabled to produce type and ornamental forms from an original or pattern by taking a mould thereof and depositing the required metal on the surface thereof, as ordinarily practised by electro-metallurgists, and when the surface has been so covered running in other metal at the back, so as to strengthen or thicken the cast thus obtained so far as to enable the cast to be withdrawn from the mould."

YOUNG, JAMES, of East Smithfield, Middlesex, gentleman. *Improvements in brewing.* Patent dated March 20, 1854. (No. 663.)

*Claims*—1. The boiling of ale and porter worts for brewing under a vacuum or partial vacuum. 2. A mode of draining off the worts from the boiling apparatus, and the liquor from mash tuns, by the aid of a partial vacuum beneath the said worts or liquor, atmospheric pressure being allowed to act on the upper surface thereof.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in sewing machines.* (A communication.) Patent dated March 20, 1854. (No. 664.)

*Claims.*—1. "An adjustable cam or its mechanical equivalent, in combination with a friction brake, for the purpose of intermitting the action of the brake upon the thread during the feed, and thus obviating the danger of sundering the thread in rapid work. 2. Enlarging that portion of the needle, which, having entered the material, is to retire from it before the pull upon the last loop is commenced. 3. Cutting away the plate on which the work rests at the place near to where the stitch is formed."

STEVENS, WILLIAM, of Birmingham, Warwick, manufacturer, and WILLIAM STEVENS, junior, of Birmingham, aforesaid, manufacturer. *New or improved machinery for grinding and polishing lenses.* Patent dated March 21, 1854. (No. 665.)

The inventor constructs grinding and polishing machinery by fixing two axes, one over the other, and attaching the grinding tool and the glass to be ground to the opposed ends of these axes, one of them having, in addition to its rotary motion, a vertical sliding motion, and the other having a vibratory or pendulum-like motion.

HANSOR, JAMES, of the Wandsworth-road, Surrey, practical chemist. *Improvements in the manufacture of illuminating-gas.* Patent dated March 21, 1854. (No. 667.)

"The object of my invention," says the patentee, "is to subject the matters from which illuminating-gas is to be manufactured, first, to a comparatively low temperature, so as to distil over vapours which are condensible, and consequently not readily inflammable, and then to cause such vapours to be again subjected to heat in a second retort, more highly heated, so as to render the vapours previously condensible into incondensible gas."

POLSON, JOHN, of Paisley, Renfrew, starch manufacturer. *Improvements in the manufacture of starch.* Patent dated March 21, 1854. (No. 668.)

This invention mainly consists in a mode of obtaining starch from maize and rice, wherein the grain, after being steeped in water, is reduced to a pulp, from which the husks, gluten, and other foreign matters are separated, by means of a sifting-apparatus, and a depositing plane, in a state fit for feeding cattle, so as, by their sale, to diminish the cost of production of the starch.

ROBERTS, RICHARD, machine-maker, and GEORGE COPPOCK, manager, both of Heaton

Norris, Lancaster. *Certain improvements in looms for weaving.* Patent dated March 22, 1854. (No. 669.)

This invention consists in a combination of parts in which the distance of the binding-picks from the cloth is regulated by the vibration of a loose reed; and in an arrangement for taking up the cloth at an even tension, notwithstanding the increasing diameter of the cloth-beam, or taking-up roller.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in japanning leather and other fabrics.* (A communication.) Patent dated March 22, 1854. (No. 670.)

*Claims.*—1. Opening the pores of the leather by impregnating it with sulphur, or any preparation of the same, for the purpose of preparing the leather for enduring a great degree of heat, and for toughening its fibres. 2. Combining sulphur with the varnish, or toughening liquid solution, and India-rubber, gutta percha, or other elastic gum, rosin, or tar, as specified.

Sheringham, John, of Edward's-square, Kensington, Middlesex, Esq. *Improvements in the construction of kettles and other like domestic utensils, and in the means of supporting or retaining the same in proper position when in use.* Patent dated March 22, 1854. (No. 672.)

Instead of using the bottoms of kettles, &c., as a medium for imparting heat to their contents, the inventor employs a separate hollow piece of metal attached to the back part of the utensil, near the bottom, in such manner as to admit of the said piece being readily detached for repairing or cleansing.

Sterry, George, of Worcester, Worcester, carver and gilder. *Improvements in the manufacture of mouldings suitable for cornices, picture-frames, architectural decorations, and other like purposes.* Patent dated March 22, 1854. (No. 674.)

This invention was described at length at page 299 of the current volume.

Watson, Thomas Simons, of West Strand, Middlesex, Esq. *An improved railway traverser.* Patent dated March 22, 1854. (No. 676.)

This invention consists in an improved mechanical arrangement for transferring railway carriages across a railway from one line of rails to another, by placing such carriages on pairs of detached rails resting on movable chairs, carried on wheels arranged to run on cross rails, motion being communicated to the chairs by two or more endless chains, which pass over wheels at each side of the permanent way and below its level.

Healey, John, engineer, and John Foster and John Lowe, spindle-makers, all of Bolton-le-Moors, Lancaster. *Improvements in certain parts of machines used for preparing, slubbing, and roving cotton and other fibrous materials.* Patent dated March 22, 1854. (No. 677.)

*Claims.*—1. Presser-flyers, wherein the elastic force to effect the pressure is obtained from twisted strands, or folds of wire, or other suitable elastic material. 2. Certain arrangements for effecting the adjustment of the elastic force upon the levers of presser-flyers.

Robinson, John Horsfall, of Hebden-bridge, York, cotton-spinner. *Improvements in steam boilers.* Patent dated March 22, 1854. (No. 678.)

These improvements mainly consist in the combination of lateral openings and passages with a central flue or flues, or with a series of tubes opening into combustion-chambers.

White, Robert Owen, of Swanscombe, Kent. *Improvements in the manufacture of Portland cement.* Patent dated March 22, 1854. (No. 680.)

In place of grinding the clay and chalk together in water and allowing these matters to settle, the chalk is washed alone and then mixed with clay by mechanical means; and in order to get the combined matters into as convenient a form as possible for drying, the mass is caused to be moulded into portions of a brick-like form.

Seiler, Frederick, of Interlaken, Switzerland. *Improvements in the manufacture and construction of solid and veneered tesselated and other shaped wood work, suitable for floorings, buildings, works of art, and other purposes.* Patent dated March 22, 1854. (No. 684.)

*Claims.*—1. "Making the woodwork mentioned in the title of solid panels of any required shape, these panels being made up of any number of pieces joined together by internal or longitudinal, external or transversal tongueing-pieces, the panels being joined together by false joists and keys. 2. The application of longitudinal and transversal tongueing-pieces and false joists to solid woodwork now in use, and especially to staircase steps. 3. The manufacture of flooring, wainscoting, and similar woodwork, from pine or deal wood, the same having been cut in a plane passing through the centre of the tree."

Whitaker, Laurence, of Haslingden, Lancaster, cotton spinner, and Doctor Ashworth, of the same place, loom tackler. *Certain improvements in power looms for weaving.* Patent dated March 22, 1854. (No. 685.)

*Claims.*—1. Securing both the extreme ends of the check strap used in power looms upon one spindle (one being upon

each side of the loom.) And 2. The adaptation and employment of a certain peculiar check strap or straps for power looms.

NEWMAN, JAMES, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of metallic tubes.* Patent dated March 23, 1854. (No 688.)

This invention consists in the manufacture of metallic tubes, by first producing a bar or rod with a core of sandy, earthy, ashy, silicious, or other such material, and afterwards boring, drilling out, or otherwise removing the core.

HOLMAN, STEPHEN, of Colney Hatch, Middlesex, engineer. *Improvements in machinery for raising and forcing fluids, part of which is also applicable to the guiding of piston-rods generally, and other rods.* Patent dated March 23, 1854. (No. 689.)

This invention mainly consists in arranging the inlet and outlet valves of pumps in pairs, one above the other, in the same chamber, the front plate or cover of which is removable on the withdrawal of screw-bolts which hold it in its place.

MONTGOMERY, RICHARD, of New York, United States, gentleman. *A new and useful improvement in corrugated metals, and in machinery for producing the same.* Patent dated March 24, 1854. (No. 690.)

*Claims.*—1. The corrugated metal plate with margins flat, or nearly so, and thicker than the middle of the plate where the folds of the corrugations are deepest. 2. The construction and arrangement of rolls for corrugating the plates in the middle, and leaving their margins flat. 3. A method of forming corrugated metal beams, by passing a plate of metal of the proper size through a series of grooves between rolls, and then through a series of crimping dies.

ROOM, HERBERT, of Birmingham, Warwick, and WILLIAM MORTON, of Birmingham, aforesaid, manufacturers and copartners. *A new or improved method of ornamenting metallic bedsteads, and such other articles of furniture as are or may be made of metal.* Patent dated March 24, 1854. (No. 691.)

This invention consists principally in attaching or connecting ornaments of glass, china, and other vitreous or semi-vitreous matters, to metal articles of furniture, but embraces also the ornamenting of these articles with ornamental parts made of metal or other solid substance.

DOIDGE, RICHARD, manufacturer, and JOHN CLOVES, machinist, both of Birmingham, Warwick. *An improvement or improvements in the manufacture of rolls to be used in shaping and impressing sweetmeats and plastic materials generally.* Patent dated March 24, 1854. (No. 692.)

This invention consists in "manufacturing rolls to be used in shaping and impressing sweetmeats, and plastic materials generally, by casting the same in moulds, and making the said moulds by attaching models of the objects to be shaped and impressed on the interior of a hollow cylinder or other shaped mould."

FOTHERGILL, BENJAMIN, engineer and machinist, and WILLIAM WEILD, engineer, both of Manchester, Lancaster. *Improvements in obtaining and preparing the fibres of plantain, penguin, and other vegetable substances for manufacturing purposes.* Patent dated March 24, 1854. (No. 693.)

The inventors describe certain elaborate processes and machinery for carrying out the same, their object being to operate upon plants of long and tenacious fibres, and containing large quantities of mucilage or moisture, in such manner as to produce materials—1. For the manufacture of rope, textile fabrics, &c.; and 2. For the manufacture of paper of various classes.

HUMPHREYS, SAMUEL, of Green-street, Leicester-square, Middlesex, military ornament manufacturer. *Improved apparatus for treating or distilling of fatty, oily, and resinous matters.* Patent dated March 24, 1854. (No. 694.)

In carrying out this invention a stratum of steam is passed between the still or vessel containing the material under treatment and the fire which heats the same; the steam being confined by an exterior case or jacket, and the induction and exit of it being regulated by cocks. This intervening stratum of steam becomes a conducting medium, and transmits heat from the fire to the material under treatment in the inner vessel.

JEYES, JOHN, of Northampton, merchant. *The manufacture of pulp from twitch or couch grass.* Patent dated March 24, 1854. (No. 695.)

*Claim.*—The manufacture of pulp from the fibre obtained after the separation of the glutinous, gummy, and other extraneous matters, from the root or plant of the twitch or couch grass.

WOOD, WILLIAM, of Monkhill House, near Pontefract, York. *Improvements in machinery or apparatus for the manufacture of carpets and other fabrics.* Patent dated March 25, 1854. (No. 696.)

This invention consists principally in introducing in succession one, two, three or more wires into or amongst the materials of the fabric from each side of the loom by the movement on their axes of separate lever arms. Each lever arm being attached or jointed to its own wire, inserts it into the open shed of the warp, and remains with it until, in its turn, after it has been woven in

wire, it is withdrawn by its arm or lever from the formed loops for re-insertion into the open shed.

BAGOT, EDWARD, of Llanelly, Carmarthenshire, South Wales, civil engineer and mineral surveyor. *Improvements in the manufacture of rails for railways.* Patent dated March 25, 1854. (No. 697.)

The inventor proposes to construct each rail of two or more distinct pieces of iron, to be held together by bolts or screws, his object being to facilitate the manufacture and renewal of rails, so that when one portion is worn out, a new piece may be inserted without disturbing the entire rail.

LOCHHEAD, JAMES, of Kennington, Surrey, gentleman, and ROBERT PASSENGER, of Union-street, Southwark, Surrey, gentleman. *Improvements in the manufacture of glass or other vitrified substances.* Patent dated March 25, 1854. (No. 698.)

These improvements relate to modifications of a former patent, dated October 15, 1852.

ROBERTSON, JAMES, of Glasgow, Lanark, North Britain, engineer. *Improvements in lifting or transporting heavy bodies.* Patent dated March 25, 1854. (No. 699.)

This invention relates to various arrangements of mechanical apparatus to be used for the general purposes of cranes, or for moving and lifting heavy bodies in various situations; the essential feature of the contrivances being the use of a working cylinder of the pendulous kind, fitted with a piston to be actuated by water pressure.

NEILSON, WALTER, of Glasgow, Lanark, North Britain, engineer. *Improvements in marine steam machinery.* Patent dated March 25, 1854. (No. 700.)

*Claims.*—1. A mode of effecting the condensation of the exhaust steam of marine engines by causing it to flow into alternate spaces formed by metallic plates placed very near together, in which spaces it is exposed to the cooling action of currents of sea-water flowing through the intermediate spaces formed by the metallic plates. 2. A mode of effecting the condensation of the exhaust steam of marine engines by means of surface condensation, in combination with the injection of cold water obtained from the condenser itself.

SMITH, THOMAS JOHN, and JOSEPH SMITH, both of Queen-street, Cheapside, London, pocket-book makers. *Improvements in the manufacture or construction of pocket-books, portfolios, and other articles.* Patent dated March 25, 1854. (No. 702.)

*Claims.*—1. The application and use in pocket-books, cases, &c., of elastic materials for the obtainment of an expanding and collapsing action of the pockets. 2. A mode of arranging and constructing pocket-books, cases, &c., with elastic connecting pieces attached to the ends of the pockets.

BEAUMONT, GEORGE, of Halifax, York, gentleman. *Improvements in machinery or apparatus for the manufacture of solid, hollow, and ornamental bricks.* Patent dated March 25, 1854. (No. 704.)

These improvements consist—*Firstly*, in combining five moulds in one metallic form, or casting in such manner that five bricks can be moulded at one operation, and so that, by joining two such metallic forms together, ten bricks can be produced simultaneously; *secondly*, in the use and arrangement of levers and compensating weights for separating the moulds from the moulded forms, &c.

PHILLIPS, FREDERICK, of the Hall Farm, Downham, near Brandon, Suffolk, land agent. *Improvements in machinery or apparatus for cutting, grating, or preparing vegetable substances.* Patent dated March 27, 1854. (No. 708.)

This invention consists in the employment of a series of circular serrated cutters, arranged side by side upon a shaft. These cutters are kept separated by means of intervening discs or washers, and the whole are held together by bolts and nuts. An adjustible curved grating or guard is fitted to the machine, and the teeth of the cutters are made to project slightly beyond it, so that the depth of cut may be regulated according to the size required.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MOORE, HENRY, foreman to Messrs. Charles and William Earle, of the Junction Foundry, Hull, York. *An improved template for facilitating the building of iron ships and vessels.* Application dated March 20, 1854. (No. 654.)

This invention consists in the employment of a template formed of strips of sheet iron or copper, or of one sheet of iron or copper (or of any other pliable material), arranged in longitudinal and cross-bars; the middle cross-bars corresponding with the ships' frames, and serving to mark the holes contained therein, while the horizontal bars serve for the holes on the next streak of plates.

WEBB, WILLIAM LOCOCK, of New Broad-street, London, civil engineer. *Improvements in pulverizing, washing, and amalgamating quartz and matters containing gold and other metals.* Application dated March 20, 1854. (No. 659.)

This invention "consists in constructing a barrel or cylinder with two or more hollow channels for the reception of a ball or balls, or other form of rolling surfaces. The

barrel or cylinder is supported at both ends by fixed hollow bearings, and turns thereon, there being friction rollers around the bearings to receive the open ends of the cylinder or barrel."

PERKINS, JOSEPH, of Kennington, Surrey, architectural modeller. *Improvements in working metals especially adapted for producing surfaces for blocks for printing calicoes, silks, paper, and other fabrics.* Application dated March 20, 1854. (No. 662.)

"I take," says the inventor, "a plate of brass, or other suitable metal, and delineate thereon the pattern or figures required; then I take strips of brass, and form or work them into the 'outline' as far as possible; the one edge of the surface I now take for the parts not connected with the outline pieces of brass, and between them I place pieces of zinc, and fix them in the proper position, and so as to let them, or some of them, abut against the other parts of the pattern. Having done this to the said plate of brass, or other metal (which, it is to be remarked, must be previously tinned or coated), I apply heat, so as to cause the tinned surface to take hold of, and solder the under edges of the whole of the pattern; and when this is fully soldered and firmly fixed, the upper surface is 'cleaned off,' so as to produce the desired level; the whole work is then immersed in dilute sulphuric or muriatic acid, or other solvent that will dissolve the zinc without injuring the other portions of the work. This will leave a patterned surface, with the whole pattern standing up in relief, secured to the under plate by the soldering action, as described. This plate being applied to blocks or cylinders, may then be printed from."

PFEIFFER, JEAN DANIEL, of Rue Princesse, Paris, France. *Improvements in bookbinding.* (A communication.) Application dated March 21, 1854. (No. 666.)

"This invention has for its object a combination of apparatus for holding and pressing books when undergoing various processes of book-binding, by which the same will be more readily and usefully carried on."

KEIRBY, EDWARD, manufacturer, Radcliffe-close, Manchester, Lancaster. *An improved reed for looms.* Application dated March 22, 1854. (No. 671.)

This invention consists in constructing a reed of moveable dents or teeth, and in a mode of first separating and then attaching the same together on rods or bolts, or by any other suitable means.

FAST, WILLIAM, of Goswell-road, London. *An improved ventilator.* Application dated March 22, 1854. (No. 673.)

This invention consists of a ventilator for windows, which is made to rise and fall by the opening and shutting of the latter, and which is constructed of one or more plates of perforated metal, extending the whole width of the window.

MADERSON, HENRY, of Clapham, and GEORGE WILLIAM WARREN, of Lambeth, both in the county of Surrey, engineers. *An improved safety-guard for gun locks.* Application dated March 22, 1854. (No. 675.)

This improved safety-guard consists of a bolt working on studs or screws against the face of the lock-plate, and provided with a catch-piece fitting into a corresponding recess in the lower part of the hammer, the bolt being held fast against the hammer by means of a spring, so as to prevent it from falling beyond a given point.

SKELTON, WILLIAM DINSLEY, of Leeds, York. *An improvement in preparing flax for spinning.* Application dated March 22, 1854. (No. 679.)

This invention consists in causing flax to be prepared by scutching, hackling, spreading, drawing, and roving, or by some of these processes, without previously being steeped or retted, and in then steeping or retting it for a suitable length of time in hot water, and afterwards spinning it in the ordinary manner.

EAGLAND, BRIGHT, of Leigh, Lancaster, manufacturer. *Improvements in the manufacture of woven fabrics, and the machinery or apparatus employed therein.* Application dated March 23, 1854. (No. 681.)

The present double wove cloth, such as contill, used for making stays or similar purposes, consists of all cotton, both warp and weft; but the inventor proposes to make one cloth of cotton and the other of cotton-warp and linen weft, using a loom with two shuttles, and a peculiar arrangement of the risers and fallers on the tappet.

COEZ, EMMANUEL DÉSIRÉ, manufacturer, St. Denis, France. *Improvements in the preparation of certain substances for the purpose of printing and dyeing fibrous materials and fabrics.* Application dated March 23, 1854. (No. 682.)

This invention "consists in forming soluble lacks from dye woods, as cuba, or campeachy wood, or fustic, or from cochineal, by treating the extracts of the coloring matter of these substances with a mixture of soda and alumine, which is known by the name of 'jelly alumine.'"

GREENWOOD, WILLIAM VITRUVIUS, and JOHN SAXBY, both of Brighton, Sussex, engineers. *Improvements in railway signal lamps.* Application dated March 23, 1854. (No. 683.)

These improvements in signal lamps consist in making one lamp double-acting, so as to throw rays of light of different colours up and down the line.

POOLE, MOSES, of Avenue-road, Regent's-park, Middlesex, gentleman. *Improvements in preventing alterations of bank-notes, cheques, and other documents.* (A communication.) Application dated March 23, 1854. (No. 686.)

This invention consists in puncturing or displacing portions of the face of a Bank-note, &c., in such manner that the vacancies or perforations cut through shall be made to represent by numerals, figures, letters, or others intelligible signs, the amount of the note, &c.

LISTER, ALFRED, of Birmingham, Warwick, manufacturer. *Certain improvements in the manufacture of metallic castings.* Application dated March 23, 1854. (No. 687.)

These improvements consist in dispensing with the use of iron or metal patterns in forming moulds for casting. As a substitute for these, patterns are formed in plaster of Paris, from which the moulds are subsequently made in sand, and from these the castings are produced.

GIBSON, THOMAS, manager, and WILLIAM KNIGHTON, foreman moulder, both of Staveley Works, Chesterfield, Derby. *Improvements in moulding and casting metals.* Application dated March 25, 1854. (No. 701.)

This invention relates to an improved arrangement of ovens for drying the moulds previous to running in the metal, and consists in the employment of a turn-table, which enables a constant supply of moulds to be conveyed to the drying ovens.

BIDDELL, WILLIAM ADOLPHUS, of Great Sutton-street, Middlesex, brass-founder. *Improvements in alarms and signals to be used in or on railways, ships, houses, buildings, plantations, or other places, for the purpose of giving audible or visible signals in cases of danger or alarm.* Application dated March 25, 1854. (No. 703.)

This invention consists in placing the detonating or explosive compound, which should be coated with gutta percha or other substance capable of resisting damp, in a box, cylinder, or case, in which is placed a moveable piston or block, so arranged that it may be drawn forward and made to compress and explode the detonating ball or balls.

FORTY, ARTHUR EDWARD, of Kennington, Surrey, stationer, and WILLIAM HAYNES, of New Kent-road, Surrey, leather dresser. *A new composition of materials suitable for mouldings, and for most purposes for which leather and gutta percha have been, or may be employed.* Application dated March 27, 1854. (No. 705.)

This invention consists in forming a composition of the more fleshy parts of hides and leather (curriers' shavings), tan, gutta percha, or caoutchouc, or gutta percha and caoutchouc, and shellac.

ARCHEREAU, HENRI ADOLPHE, of Paris, France. *Certain improvements in treating powders of charcoal, coke, coal, peat, and generally all matters obtained by the carbonization of mineral, vegetable, and animal substances, and in applying the said powders to useful purposes.* Application dated March 27, 1854. (No. 706.)

The powder is mixed in different proportions, according to the use to be made of it, with one or more of the following substances: — Coal tar, residue of coal tar, pitch, resinous and bituminous substances, gums, oils, varnishes, glues, fatty and ceramic substances; and is then subjected to a heat which renders the substance viscous or liquid.

PRINCE, ALEXANDER, of Trafalgar-square, Middlesex. *An improved method of hardening fatty and oily matters employed in and for the manufacture of candles.* (A communication.) Application dated March 27, 1854. (No. 707.)

This invention consists in hardening fatty and oily matters by mixing them with a species of gum-resin or vegetable wax, which is produced abundantly in the districts of Para and Maranhâo, in South America, and elsewhere.

## PROVISIONAL PROTECTIONS.

*Dated August* 16, 1854.

1788. William Burgess, of the firm of Burgess and Key, of Newgate-street, London, agricultural engineers. An improvement in or addition to reaping and mowing-machines.

*Dated August* 30, 1854.

1897. Barnett Meyers, of Savage-gardens, Tower-hill, Middlesex, importer and manufacturer. Improvements in walking-stick guns. A communication.

*Dated September* 6, 1854.

1947. Joseph Westwood, of Poplar, Middlesex, iron shipbuilder, and Robert Baillie, also of Poplar, Middlesex, iron shipbuilder. A method of protecting iron ships and vessels from corrosion and animal and vegetable matters.

*Dated September* 18, 1854.

2011. William Simpson, of Birmingham, Warwick, agricultural-implement manufacturer. An improvement or improvements in beams or girders for bridges and other structures.

2013. Nathan Thompson, junior, of New York, United States of America. Improvements in life-preserving seats.

2015. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in tuning-keys for pianofortes and other stringed musical instruments. A communication.

2017. Samuel Crabtree, of Bradford, York, manager. Improvements in machinery for combing wool, hair, and other fibrous substances.

*Dated September* 19, 1854.

2019. William Henry Dawes, of Handsworth,

Stafford, ironmaster. An improvement in the manufacture of iron.

2021. John Cunningham, of Beith, Ayr, card-perforator. Improvements in the preparation or production of printing surfaces.

2023. James Kershaw, of Bury, Lancaster, over-looker. Improvements in looms for weaving.

*Dated September* 20, 1854.

2025. William Gee, of Birmingham, Warwick, stamper and piercer. An improvement or improvements in the manufacture of braces used for boring, driving screws, and other such like purposes.

2027. James Robinson, of Huddersfield, York, manufacturing chemist. Improvements in apparatus for generating steam and gas and consuming smoke.

2029. Victor Athanase Pierret, of Paris, France, and of Old Compton-street, Soho, Middlesex. Improvements in watches and clocks.

2031. Jean Baptiste Edouard Savary, and Jules Felix Hazard, both of Paris, France, engineers. Improvements in pumps.

2033. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in machinery for washing paper stock. A communication.

2035. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in sewing-machines. A communication.

*Dated September* 21, 1854.

2037. Henry Hudson, of the South Shields Flint Glass Works, South Shields, Durham, glass-manufacturer. Improvements in the manufacture of vessels for measuring fluids.

2039. Jean Antoine Passet, of Paris, France, machinist. Improved machinery or apparatus for pressing or calendering fabrics.

2041. William Hodson, of Kingston-square, Hull, tile-maker. Improvements in apparatus for the manufacture of bricks, tiles, and other articles from plastic materials.

*Dated September* 22, 1854.

2042. William Crofts, of Derby-terrace, Nottingham-park, lace-manufacturer. Improvements in the manufacture of fringes and other plain and ornamental fabrics.

2043. James Egleston Anderson Gwynne, of Essex Wharf, Essex-street, Strand, Middlesex, engineer Improvements in machinery for lifting, forcing, and exhausting.

2044. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for manufacturing cards employed in the preparation of fibrous materials. A communication from François Pierre Morel, of Tarare, France, manufacturer.

2045. Henry Holland, of Birmingham, Warwick, umbrella and parasol manufacturer. Improvements in the manufacture of umbrellas and parasols.

2046. Thomas Lawrence, of Birmingham, Warwick, manufacturer. Improvements in machinery or apparatus to be employed for the purpose of shaping and finishing certain parts of bayonets.

2047. Peter Spence, of Pendleton, Lancaster, manufacturing chemist. Improvements in obtaining sulphur from iron pyrites and other substances containing sulphur.

2048. George Collier, of Halifax, York, manager, and Samuel Thornton, of Rochdale, Lancaster, machinist. Improvements in looms for weaving.

2049. William James Brown, in the employ of Messrs. Ames, Bush, and Co., of Bristol. Improvements in a composition or combination of materials to be used for sizing yarns and other articles.

*Dated September* 23, 1854.

2050. Thomas Garnett, of Liverpool, Lancaster, engineer. Improvements in steam engine and other governors.

2051. Pietro Peloj, of Fleet-street, London, confectioner. Improvements in the manufacture or construction of a knife and fork.

2052. Thomas Banks, of Derby, mechanical engineer, and Henry Banks, of Wednesbury, Stafford, iron-merchant. Improvements in apparatus for retarding and stopping railway trains.

2053. Samuel Elliott Hoskins, M.D., F.R.S., of Guernsey. An improvement in the manufacture of paper.

2054. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the generation of steam. A communication from Paulin Jean Charles Montety, of Toulon, France.

2055. Robert Pinkney, of Long-acre, Middlesex, ink-manufacturer. Improvements in stoppers, corks, or valvular apparatus for bottles or receptacles for liquids, and in the machinery or apparatus employed for making the same.

2056. George McNaught, of Glasgow, Lanark, saddletree-maker. Improvements in saddletrees.

2057. Georges Danré, of Marseilles, France. Certain improvements in gas-burners.

2058. Henry Alexandre Genetreau, of Paris, France. An improved system of carriage-shafts, poles, or beams.

*Dated September* 25, 1854.

2059. William Marshall, of Wachinghem, Pas de Calais, France, gentleman. An improvement or improvements in metallic wheels for railway and other purposes.

2060. Robert McConnel, of Glasgow, Lanark, ironfounder. Improvements in locks.

2061. Philip James Chabot, of Spitalfields, Middlesex. Improvements in supplying air to furnaces.

2062. Henry Heather Bigg, of Leicester-square, Middlesex, anatomical-instrument maker. Improved apparatus for curing deformities of the human frame.

2063. Henri Catherine Camille de Ruolz and Anselme Louis Marie de Fontenay, both of Paris, France, civil engineers. Improvements in the treatment of certain metals for producing an improved metallic alloy.

2064. William Palmer Surgey, of Hackney, Middlesex, gentleman. Improvements in cigars, cigarettes, and cheroots.

*Dated September* 26, 1854.

2065. Joshua Bacheler Halsey, mining engineer, of Norfolk-street, Strand, Middlesex. An improved machine or apparatus for crushing and pulverizing ores, and for separating the gold therefrom by amalgamation.

2066. Louis Cornides, of Trafalgar-square, Middlesex. A new mode of manufacturing a transparent medium, plain, printed, and coloured, of gelatine, in combination with other substances.

2067. Joseph Boulton, of Coppice-row, Clerkenwell, Middlesex. Improvements in dry gas-meters.

2068. George Spencer, of Alpha-road, New Cross, Deptford. Improvements in the external coverings of roofs and walls of buildings and sheds, and in the windows of such buildings and sheds.

2069. William Flowerdew Sadler, of Tooley-street, Southwark, Surrey, millwright, engineer, and manufacturer to the government of submarine apparatus for the recovery of sunken property. A machine or apparatus for using up all the smoke of furnaces and other fireplaces.

2070. Thomas Clayton, of Oldham, mechanic, and Robert Harrop, of Lowside, near Oldham, Lancaster, mechanic. Improvements in ornamenting wood, and in the machinery or apparatus connected therewith.

2071. The Honourable James Sinclair, commonly called Lord Berriedale, of Hill-street, Mid-

dlesex. Improvements in treating, cleansing, and ornamenting paper and other surfaces.

*Dated September* 27, 1854.

2073. John Simon Holland, of Woolwich, Kent, engineer. Improvements in large and small fire-arms, and in the preparation of their charges.

2074. William Kimmins M'Minn, of Robert-street North, Liverpool, Lancashire. Letting go and heaving up ships' anchors, which he calls a double acting anchor purchase.

2075. Charles Barraclough, of Halifax, York, mechanic. Improvements in machinery or apparatus for the manufacture of clog soles and patten soles by power.

2076. Jonathan Edge, of Bolton-le-Moors, Lancaster, engineer. Improvements in pistons.

2077. John Chambers, of Manchester, engineer. Improvements in washing fabrics, and in machinery employed therein.

2078. Robert Hoyle, of Whitehead-bridge, Bury, Lancaster, machine-maker. Improvements in preventing incrustation in steam-boilers.

2079. Robert Renfrew, of Glasgow, Lanark, smith. Improvements in bobbins.

*Dated September* 28, 1854.

2080. Frederick Clark, of King-street, Westminster, Middlesex, turner. An improved spindle and bush for door-knobs, and other similar uses.

2081. Aretas Young Crosse, of Blackheath, Kent. Improvements in the manufacture of buttons.

2082. John Rogerson and James Brimelow, of Bolton, Lancaster, engineers. Improvements in certain parts of steam-engines.

2083. James Simpson, of Rochdale, Lancaster, woollen manufacturer. An improvement in the manufacture of printers' blankets.

2084. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in the rigging of sailing vessels. A communication.

2085. William Hutchinson, of Salford, Lancaster, engineer, and William Barlow, of the same place, engineer. Improvements in steam boilers.

2086. William Beckett Johnson, of Manchester, Lancaster, engineer. Improvements in lamps and other apparatus used for illumination.

2087. George Crux, of Manchester, Lancaster, laceman. Improvements in the production of bonnets, children's hats, and similar coverings for the head.

2088. John Woodward, of Barnet, Hertford, office clerk. Certain apparatus for stopping shot and other holes in ships and vessels.

2089. Charles William Lancaster, of New Bond-street, Middlesex, gun manufacturer. Improvements in fire-arms, and in cartridges to be used therewith.

2090. Moses Poole, of Avenue-road, Regent's-park, Middlesex. Improvements in cylinder paper machines. A communication.

2091. Louis Beer, manufacturer, of Elbeuf, (Seine Inférieure), France. Certain improvements in machinery for shearing piled, terry, or raised fabrics.

*Dated September* 29, 1854.

2092. Thomas Foxall Griffiths, of Birmingham, Warwick, manufacturer. An improvement or improvements in lamps.

2093. Thomas Mohan, of Aclint, Louth, farmer. An improved churn.

2094. Walter Sneath, of Derby-road, Nottingham, mechanic. An improvement in sewing-machines.

2095. John Nelson Gamewell, of Camden Kershaw district, South Carolina, United States. Improvements in instruments for relieving the wires of the electric telegraph of atmospheric electricity.

2096. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery for removing the points from the hairs of rabbit and other skins employed in the manufacture of hats, and similar articles. A communication from Paul Désiré Chaumont.

*Dated September* 30, 1854.

2098. James Bradbury and John Bradbury, of Denton, Lancaster, machinists. Improvements in machinery or apparatus for manufacturing or producing piled goods or fabrics.

2100. Gémis Filhon, of Paris, gentleman. Improvements in glass chimneys for gas-burners or lamps.

2102. Arthur Boyle, of Birmingham, Warwick, tool-maker. Improvements in making umbrella and parasol stretchers.

2104. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and George Payne, of the same place. Improvements in the manufacture and application of rosin oil.

*Dated October* 2, 1854.

2106. Thomas Gray, of St. Clement's-lane, Strand, Westminster, printing-ink manufacturer. A new and improved method of preparing and bleaching raw and fabricated fibrous substances now used in the manufacture of paper, or which are applicable to be used in such manufacture.

2108. William Woods Cook, of Rumforth, near Bolton, Lancaster, muslin manufacturer. An improved method of weaving or manufacturing woven fabrics suitable for petticoating, or similar purposes, where thick and thin parts of the same fabric are required.

2110. William Partington, of Bonhill, Dumbarton, bleacher. Improvements in bleaching.

2112. Charles Bowles Hare, of Bristol, floorcloth manufacturer. An improved mode of manufacturing printing blocks.

2114. John Penn, of Greenwich, Kent, engineer. An improvement in the bearings and bushes for the shafts of screw and submerged propellers.

2116. John Stephens, of the Temple, gentleman. Improvements in apparatus for supplying purified air to rooms or buildings.

*Dated October* 3, 1854.

2120. John Jeyes, of Northampton, seed merchant. An improvement in the manufacture of paper, threads, and yarns.

2122. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the construction of locks. A communication from Laurentius Mathias Eiler, of Copenhagen, Denmark, land surveyor.

2124. Christopher Nickels, of the Albany-road, Surrey, and James Hobson, of Leicester. Improvements in apparatus used when weaving piled fabrics by the aid of wires.

2126. Thomas Cooper, of the Isle of Wight, Hampshire, brick-maker. An improvement in the manufacture and in the mode of joining earthen pipes.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October* 17*th*, 1854.)

1256. David Atkinson. Improvements in printing, and in the machinery or apparatus to be employed therein or connected therewith.

1258. John Mansfield. An improvement or improvements in steam boilers.

1265. Michael Scott. Improvements in roofing or covering reservoirs or holders for liquids.

1267. Joseph Skertchly, junior. Improvements

in the manufacture of gates, hurdles, and fencing, in vehicles, wagons, carts, and trucks for common roads and railways, and in facias, entablatures, window headings, parapet, and other mouldings projecting from the brickwork of buildings.

1275. John Nelson and David Boyd. Improvements in preparing and scutching flax, hemp, and other substances.

1279. Julian Bernard. Improvements in stitching and sewing-machines, and in machines for securing and ornamenting parts of garments and other materials.

1302. Samuel Varley. An improved construction of haymaking machine.

1304. John Edwin Piper. Improvements in the preparation of linen, cotton, and other fabrics, to produce a factitious leather.

1307. Thomas Mara Fell and William Cooke. Improvements in ventilators.

1313. Frederick John Julyan. Improved methods of producing musical sounds.

1326. Auguste Édouard Loradoux Bellford. Improvements in water-mill machinery. A communication.

1384. Salomon Dreyfus-Werth and Pierre Meunier. A new or improved system of applying designs to all kinds of fabrics and of surfaces of wood, marble, and stone.

1390. William Ellsworth Osborn. Improvements in breech-loading guns or cannon.

1398. Joseph Davies. Improvements in propelling vessels.

1415. Richard Leicester Antrobus. A new or improved method of printing oil-cloth for floor and table-covers, paper-hangings, and other surfaces.

1432 John Edwards. Improvements in railway chairs.

1485. William Newzam Nicholson. Improvements in hay-making machines, part of which improvements is applicable to carriages generally.

1506. Felix Lieven Bauwens. Improvements in the manufacture of soap.

1541. John Hackett. A new method of fastening the ends of India-rubber elastic cord and India-rubber elastic web.

1544. Robert James Maryon. Improvements in the construction of, and arrangement of, and application of, steam-engines, for the better means of transmitting motion and of applying steam or other motive power.

1546. William Bishop. Improvements in machinery or apparatus for ticketing or labelling spools, parcels of the same, or other similar parcels.

1619. James Dilks. The application of printed or painted linen, cotton, or other textile fabric, either plain or ornamental, for binding more effectually than heretofore packets or parcels of lace, hosiery, or other articles.

1754. Joseph Reimann and Friedrich Sauermann. Improvements in fire-arms.

1756. Thomas Lawrence. An improvement or improvements in the manufacture of bayonet-blades, and in machinery or apparatus to be employed for that purpose.

1789. William Siddons. Improvements in locks for guns and other fire-arms.

1897. Barnett Meyers. Improvements in walking-stick guns. A communication.

1950. George Printy Wheeler and Samuel Bromhead. The production of new fibrous materials capable of and suited for the manufacture of string, rope, matting, and various fabrics with or without the combination of cotton, wool, or flax, or for pulp for the manufacturing of paper, papier maché, millboard, &c.

2001. William Bramwell Hayes. Certain improvements in looms for weaving.

2005. George Frederick Evans and Frederick John Evans. Improved apparatus to be used in the distillation of coal and other bituminous or resinous substances.

2012. John Ashworth. Certain improvements in sizeing and stiffening textile materials or fabrics.

2013. Nathan Thompson, junior. Improvements in life-preserving seats.

2021. John Cunningham. Improvements in the preparation or production of printing surfaces.

2027. James Robinson. Improvements in apparatus for generating steam and gas and consuming smoke.

2044. John Henry Johnson. Improvements in machinery or apparatus for manufacturing cards employed in the preparation of fibrous materials. A communication from François Pierre Morel, of Tarare, France, manufacturer.

2064. William Palmer Surgey. Improvements in cigars, cigarettes, and cheroots.

2071. The Honourable James Sinclair, commonly called Lord Berriedale. Improvements in treating, cleansing, and ornamenting paper and other surfaces.

2075. Charles Barraclough. Improvements in machinery or apparatus for the manufacture of clog soles and patten soles by power.

2090. Moses Poole. Improvements in cylinder paper machines. A communication.

2104. George Fergusson Wilson and George Payne. Improvements in the manufacture and application of rosin oil.

2110. William Partington. Improvements in bleaching.

2114. John Penn. An improvement in the bearings and bushes for the shafts of screw and submerged propellers.

2126. Thomas Cooper. An improvement in the manufacture and in the mode of joining earthen pipes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed October* 13, 1854.

866. Arthur Hawker Cox.
872. Joseph Croisy.
890. Julian Bernard.
891. Julian Bernard.
892. John Rowley.
906. Thomas Vickers.
972. William Alfred Waddington.

*Sealed October* 17, 1854.

895. John Frearson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*R. N. B.*, of Birmingham, writes as follows:—"In the case of a Provisionally Registered Design, would the proprietor be subject to the loss of his protection by merely *showing samples*, with a view to get orders, or to ascertain the probable sale of the same, previous to going to the expense of

Complete Registration?" No; samples may be exhibited for the purpose in question. It is the *sale* alone that would annul the right to protection.

*J. Carkeet.*—We do not know where a sketch of the machine may be seen, nor are we aware of the existence of an instrument designed specially for that purpose.

*T. Dale.*—We also believed that the light-draught gunboats recently built at Mr. Pitcher's yard, and at Deptford Dockyard, were to be armed with heavier metal than the 56-pounders with which they are now fitted. The change may, for all we know, have been necessitated by some *blunder* in their construction, as you surmise. What armament the *Floating Batteries* are intended to carry we do not yet know.



CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1629.] SATURDAY, OCTOBER 28, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## WOODCOCK'S SMOKE-CONSUMING FURNACE.

Fig. 1.

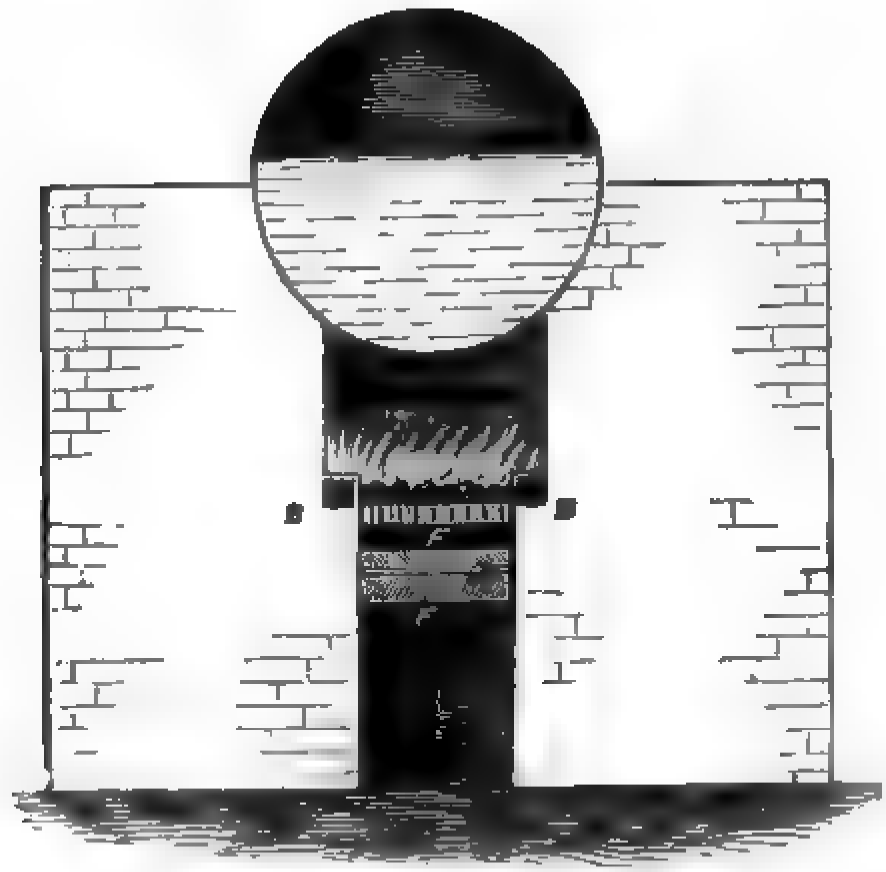
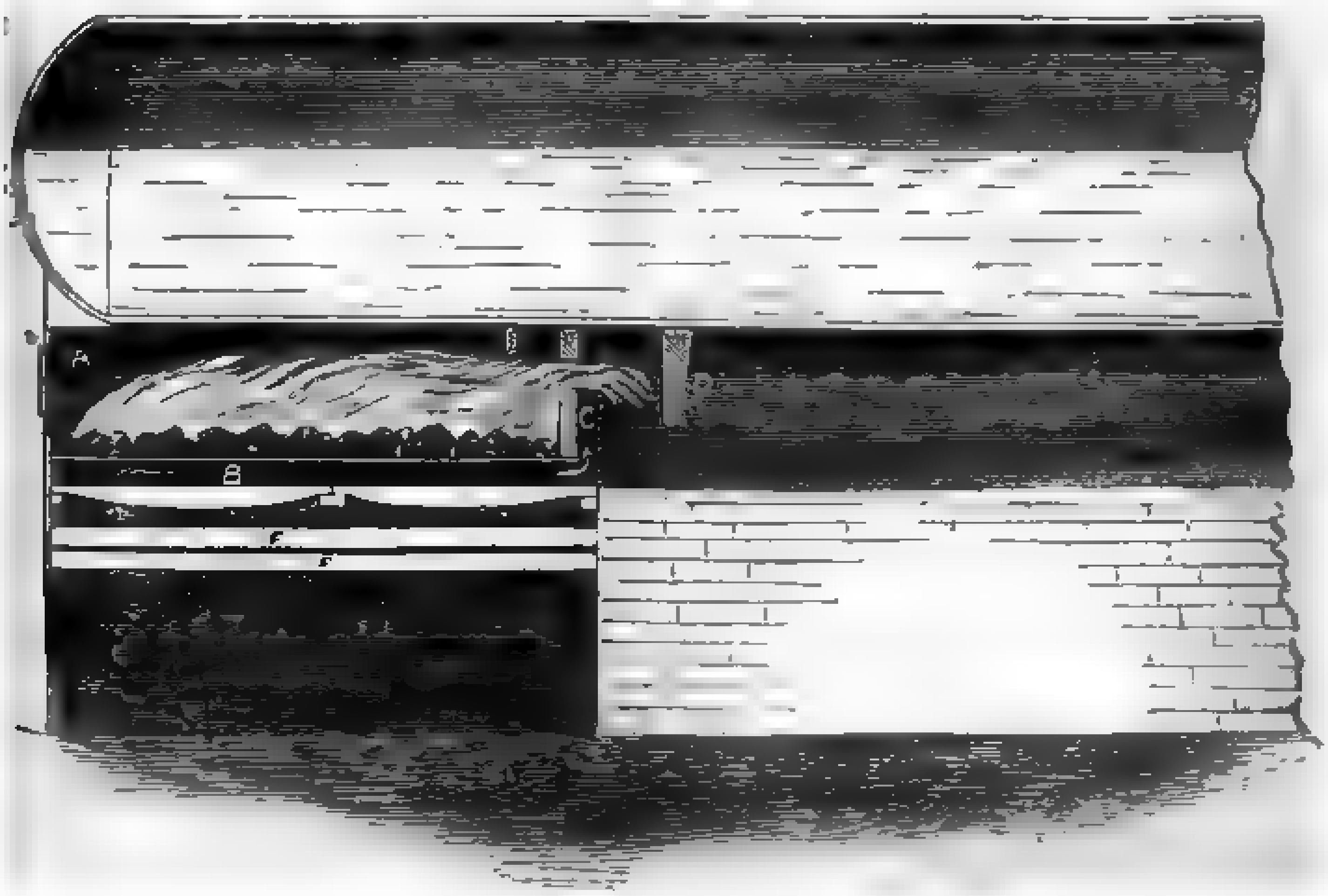



Fig. 2.



## WOODCOCK'S SMOKE-CONSUMING FURNACE.

CONSIDERABLE attention having been drawn to Mr. Woodcock's furnace, by the letter which appeared on page 365 of our current volume, and by articles published subsequently in other journals, we present on the preceding page an engraving representing its peculiar features. As several of our correspondents are discussing the qualities of the arrangement in another portion of this Number, we shall do no more at present than simply give a description of it, and state that it may be seen in operation at Meux and Co.'s brewery, where it has, we believe, given complete satisfaction, as might indeed have been anticipated; for, whatever contention may arise as to the novelty of the furnace, there can be but little room to doubt its *efficiency*, while it continues in full working order.

Fig. 1 is a cross, and fig. 2 a longitudinal section, both being partly in elevation. A is the furnace; B are the air-tubes which pass from the front of the furnace to the chamber, C, which is situated behind the bridge. The bridge itself extends from the bed of the furnace to the boiler, having, towards the upper part, an aperture through which the whole of the gases evolved from the fuel on the bars have to pass on their way to the flues. The back of the chamber, C, is formed of a wall or plate, in which are an aperture corresponding to the one in the bridge, and a number of perforations through which the air admitted by the heated tubes, B, to the chamber, C, passes, mixing, as it leaves the chamber, with the combustible gases streaming through the aperture, and effecting their combustion. At a little distance from the chamber is placed a second bridge, D, extending down from the bottom of the boiler, its object being to drive the gases more together before they reach the flue, E, and also to avoid the generation of too intense a heat at one particular portion of the boiler. Another shallow bridge or plate, reaches down from the boiler, just before the foremost bridge, to about the height of the upper side of the aperture formed in the latter. Below the fire-bars are arranged two series of inclined plates, F, one above the other, the object of which is to prevent the wasteful radiation of the furnace-heat into the ash-pit, and, by keeping the latter cool, to secure the introduction, through the fire-bars to the furnace of air, of as nearly as possible the same density as that of the surrounding atmosphere.

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## A NEW PROOF OF THE BINOMIAL THEOREM.

*To the Editor of the Mechanics' Magazine.*

SIR,—I send you a proof of the binomial theorem which has, I think, some new features in it. If you deem it worth the attention of your readers, it is at your service.

I assume that whatever be the value of $n$, $(1+x)^n$, can be expanded in a series of the form,

$$1+Ax+Bx^2+Cx^3+\&c.,$$

where A, B, C, are functions of $n$ only. Then since

$$\left\{(1+x)^2\right\}^n = \left\{(1+x)^n\right\}^2,$$

$$\text{or, } \left\{1+(2x+x^2)\right\}^n = \left\{(1+x)^n\right\}^2$$

therefore the equation,

$$1+A(2x+x^2)+B(2x+x^2)^2+C(2x+x^2)^3+\&c.$$
$$=\left\{1+Ax+Bx^2+Cx^3+\&c.\right\}^2$$

$$\text{or, } 1+2Ax+(A+4B)x^2+(4B+8C)x^3+\&c.=1+2Ax+2Bx^2+2Cx^3+\&c.$$
$$+A^2x^2+2ABx^3+2ACx^4+\&c.+B^2x^4+2BCx^5+\&c.+C^2x^6$$

Hence, equating coefficients

$$A+4B=2B+A^2, \text{ and } 4B+8C=2C+2AB.$$

$$\text{So that, } B=\frac{A(A-1)}{2}, 3C=B(A-2), C=\frac{A(A-1)(A-2)}{1\,.\,2\,.\,3}$$

Pursuing the method, we can find,

$$D=\frac{A(A-1)(A-2)(A-3)}{1\;.\;2\;.\;3\;.\;4}$$

$$E=\frac{A(A-1)(A-2)(A-3)(A-4)}{1\;.\;2\;.\;3\;.\;4\;.\;5}$$

$$\&c. = \&c.$$

So that,

$$(1+x)^n=1+Ax+\frac{A(A-1)}{1\;.\;2}x^2+\frac{A(A-1)(A-2)}{1\;.\;2\;.\;3}x^3+\&c.$$

To determine A we have only to consider the forms which the formula must take in the cases when $n=0$, and when $n=1$.

Now, when $n=0$ all the terms in the series which involve any power of $x$ must vanish, and this can only be by A becoming nothing; hence, when $n=0$ $A=0$.

Therefore A must be of the form

$$A=a\,n \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (I.)$$

Again, it is evident that when $n=1$, $A=1$

So that substituting in equation (I.)

we get $a=1$,

and hence $A=n$.

Our formula now then takes the form

$$(1+x)^n=1+n\,x+\frac{n.\overline{n-1}.}{1\;.\;2}x^2+\frac{n(.n-1).\overline{n-2}.}{1\;.\;2\;.\;3}x^3+\&c;$$ the ordinary binomial expansion.

I am, Sir, yours, &c.,

BREVIS.

## THOUGHTS ON THE CALORIC ENGINE.

BY THOMAS EWBANK, ESQ.*

THE substance of this paper was written a year ago, and withheld from the press lest it might be deemed a gratuitous interference with parties worthily striving to accomplish a great purpose. The caloric engine has now been so long before the public, that no remarks made on it can, in the slightest degree, affect it. It has become the subject of general—almost universal remark. No enemy, if it ever had one, can take from it aught belonging to it, nor fasten upon it defects from which it is free. Indeed, it is absurd to suppose discussion, or even bitter opposition, can at this day seriously injure, or injure at all, any project in mechanical science which appeals to actual experiment for proof of its worth. A truth in physics is as impregnable as a moral one, nor can the enthusiasm of the world in favour of an error successfully sustain it.

It is the *principle* of the engine that is here considered, not the mechanism at all, except so far as is requisite to elucidate the principle. Nor have the following remarks anything to do with the absolute mechanical equivalent of heat, which may, or may not, be greater or less than heretofore imagined. It may very well be that more power can be drawn out of heat when applied to air than has been obtained from its application to water; a result which, if attained, would simply show the equivalent to be greater than previously supposed, or that it varies with the media through which heat is employed.

The very bold and continued claims on behalf of the caloric engine have induced a disposition among some philosophers to give up the received theory of heat in relation to power, and to look out for another. To the practical man, speculations on heat, separate from ponderable agents it circulates in, are little more to the purpose than inquiries about the soul of a draft animal when estimating its strength or the work it performs. To him the "phenomena of latent heat," as regards liquids, are sufficiently accounted for by *diffusion*. A spoonful of syrup is less sweet when poured into a tumbler of water, still less in a gallon, and insensible or latent when diffused in larger quantities. Like heat in common air, or in a bar of iron, the syrup may, by concentration, be again collected. It suffices him to know, that heat is Nature's grand expanding agent, and that nothing can be elastic without it; that every form of matter has its own share allotted to it, and when increased or diminished by

* From the *Journal of the Franklin Institute.*

external influences, the natural quantity is resumed when they are removed.

As regards the conversion of heat into mechanical action, it is now said that the work done is, in every case, proportional to the quantity lost or destroyed in the operation, and that whatever escapes, as in the puffs of steam from steam engines, has passed uselessly through them. Accordingly, it has been inferred that a low-pressure engine turns to account only 5 per cent., and a high-pressure one 2½; that is, in the former, nineteen-twentieths of the power are wasted, and in the other, out of forty measures, all save one. Such is a recent French hypothesis. Those who have occasion repeatedly to load an engine to the verge of its power, who observe how its pleasant movements become laborious strainings, and its easy breathings prolonged groans, will hardly be persuaded that all the power above 5 or above 50 per cent. is then lost.

Supporters of this hypothesis differ from those of another, but their object is the same. With like feelings they direct their eyes to the hissing and roaring fluids rushing from waste pipes, like crowds of lusty labourers out of factory gates to play. It grieves them to see so much power dissipated. One party, thinking it has done no work, since it comes out so noisy and turbulent, proposes to give it enough to exhaust it; the other, beholding it so vigorous, thinks to send it back as often as it escapes, until it breathes its last. Both, we apprehend, are mistaken. They resemble, to some extent, those who, having purchased goods and consumed them, wish for their money again, or for another supply without charge. There does not appear to us any sufficient reason or facts why a motive machine should be charged with imbecility or prodigal waste because it does not annihilate its motive element, nor yet why that element may not, after raising a piston, be discharged unscathed. The purpose is to use it, not to destroy it, and surely the heat of air and steam engines is no more annihilated than it is in the breath of animals, in air-guns and sarbacans, in fire-arms, digesters, and common cauldrons. In whatever machine it is employed, it finds its way (whether it do much work, or little, or none) either through open channels or through the materials of its prison walls, into the atmosphere, the great and rapid equalizer of artificial temperatures.

Intricate reasonings on the principles and action of motive gas engines will never be studied by the public; but there are salient points in them which the popular mind can perceive at a glance, and thence correctly infer the characteristic features of each.

Motion in them is caused by a change of volume which the motive fluid undergoes after being forced into a close chamber. It is there swelled by fire, and consequently requires more power to keep it in than was spent in putting it in prison; its increase of resistance being measured by its increased bulk, and the bulk depends on the heat it takes up. Had it undergone no change, the equilibrium of the machine would not have been disturbed, but now in its efforts to burst through the walls that confine it, the weakest part (the piston) gives way before it. After pushing this back, the object of its imprisonment, it is allowed to escape, when a fresh charge is introduced to drive back the piston to its former place, and the operation is repeated.

In these engines it is clearly desirable that the expanding agent should be presented in as compact or condensed a form as possible, since the resulting force depends on the quantity, not volume, of the matter dilated; hence solids and liquids give out more power than air, because its materials are already dilated into the gaseous state. Detonating compounds contain large volumes of gases. A pint of gunpowder gives out 250 gallons. A pint of water makes 212 gallons of steam, while the same heat* that boils water would not swell a pint of air into a quart. Another striking mark between steam and air engines is, in the different dimensions of their feed-pumps. This is unavoidable, resulting, as it does, from the widely different densities of water and air. The feed-pump of a steam engine need not exceed *one-sixteenth-hundredth* of the capacity of the working cylinder; that of an air-pump is required to be *two-thirds*. The power abstracted by these from the effective force of their respective engines is in the same proportion. From the steam engine its feed-pump takes away only $\frac{1}{1600}$ of its power, while that of the air engine abstracts no less than *sixty-six* per cent.

Thus, an air engine can only transmit one-third of its power to any work to be done, while a steam engine gives out the whole, for the small amount withheld to work its pump is too trifling to be noticed in general results. We are therefore inclined to think that air is too attenuated a body to supersede or successfully compete with steam by any further expansion than can practically be given to it.

But the efficiency or inefficiency of atmospheric air, as an agent for obtaining motive power from fire, would at this day have excited little attention had it not been connected with the surprising proposition that, by means of it, a mechanical force when once given out can be made to act a second,

* By this, it is presumed, the writer means not the same absolute heat, but the same sensible temperature.

third, fourth, or fortieth time. This it is that marks the caloric engine as an extraordinary one—extraordinary for its claims—since, by no contrivance heretofore has the smallest amount of force been caused *to repeat itself*. We are constrained to believe it cannot, and that the idea is allied to those according to which power is ceaselessly to circulate through prime movers and the objects they move. Objections may be raised to references to the natural world, but we are very sure if the strange thing exists not in nature, it is opposed to nature, and exists not at all. Man makes not principles.

* * * *

In every age, of which records have reached us, men have sought to leap over the boundaries that limit the range of their faculties, and the conditions imposed upon matter. Captivated by plausible suggestions, those of an inventive turn have mistaken illusions for realities, and have laboured and reasoned to persuade the world they were right. Of these mockeries none have been more hotly pursued than an instrument which, as a consequence of the forms, proportions, and arrangement of its parts, shall start into action, and continue to act till its materials wear out or its members fall asunder. To effect this, endless contrivances and modifications of contrivances have been tried, and, notwithstanding uniform and universal failure have marked all past and present efforts, there are still some, and even among the learned, who believe the thing possible; gentlemen who would certainly receive with incredulity the announcement of a similar creation in the animal kingdom. Of the two miracles, the one they hope to perform would be incomparably the greatest.

There are those who discard as absurd all attempts to gain power by wheels, springs, and levers, and yet imagine they can get it by fluids without giving anything like the usual price paid for it; and so specious have schemes on this plan appeared, that both experienced and inexperienced men have been led astray. As steam, for example, after raising a piston retains its properties and most of the power, or heat, it had in the boiler, it has been thought no difficult matter to withdraw it for a moment till the piston descends and then let it in again, instead of discharging and replacing it with a fresh supply from the boiler. Why, instead of a single exertion of its power, not compel it to urge the piston at least a few times to and fro before dismissing it screeching from service?

Of this class of inventors, Captain Ericsson is the most prominent now before the public. The principle on which his invention rests is, the repeated use of the same caloric. In his engine, as in the steam engine, *heat* is the animating principle, and in using over and over the same heat, he virtually and actually uses over the same power. He claims to have succeeded in seizing upwards of 90 per cent. of heat expended in raising a loaded piston, and in returning and compelling it to do the same work over again; and that but for practical difficulties and imperfections attending the construction of a new class of machines, the *whole* heat might be saved from running to waste, and put in constant use. Captain E. is said thus to have reduced the consumption of fuel to an unheard of degree. Of this there can be no doubt, *if he is not mistaken*. Apply the same improvements to ocean steamers, and their boilers will be reduced to kitchen cauldrons and their furnaces to parlour grates.

The idea appears to have arisen (see further on,) out of some undefined notions of the nature of heat, and that when united with a fluid medium it can somehow or other be used independently of the laws that control ponderable bodies.

* * * *

It was comparatively in late days, that the relation of heat to mechanical force was studied, and more recently, that their mutual equivalents were ascertained, or approximately ascertained; but, as will appear, the accepted doctrines in this branch of physics are repudiated by Captain Ericsson. John P. Sargent, Esq., the solicitor for Captain E., in a Lecture before the Boston Lyceum, in 1844, on Ericsson's Inventions, [Wiley and Putnam, New York and London, 1844,] observes:

"The object of Ericsson's caloric engine, is the production of mechanical power by the agency of heat, at an expenditure of fuel so exceedingly small, that man will have an almost unlimited mechanical force at his command, in regions where fuel may now be said hardly to exist. The announcement of such an idea may startle all those acquainted with the nature of heat, and the well-known limits of the amount of mechanical power which any given quantity of caloric is capable of producing; more particularly, as it is a well established fact, that a given quantity of heat will exert an equal amount of mechanical power, to whatsoever medium it may be imparted.

"Ericsson's theory of heat is altogether in opposition to the received notion, that the mechanical force produced will bear a direct known proportion to the quantity of caloric generated. * * * * The basis of the caloric engine is, that of returning the heat, at each stroke of the piston, and using it over and over again. * * * *

This result Captain Ericsson has accomplished by means of an apparatus which he styles a *regenerator;* and so perfectly does it operate, that the heat employed in first setting the engine in motion, continues to sustain it in full working force, with no other renewal or addition than may be requisite to supply the inconsiderable loss by radiation."—Pages 51—55.

This is what Ericsson and his friends still claim, and assuredly if he can, by any device, regenerate an ounce of power, or if he can send half an ounce back to the working cylinder and make it do its work over and over again, he has done what man never did before him, and what the Creator has not, that we know of, done in any one of His motive machines.

The regenerator is an ingenious device, but not what its name implies. It is at best but an economizer of heat in the same sense and after much the same manner as contrivances by which waste steam of engines impart, heat to cold water supplies; and it is yet to be proved, that in either case, *any* heat is absolutely saved, except it be from a surplus admitted into cylinders over that required to move the pistons; and even then, whether what is arrested and returned to the receiver or boiler, be not procured at an expense equal to its value. We worked a stationary high-pressure engine for years: the steam, after doing its work, was conveyed into a wide and shallow box, in which two or three fathoms of the feed pipe (between the pump and boiler) was coiled. The cold water, ere it entered the boiler, was thus raised to about 160° Fah. That this additional temperature derived from the waste steam was a clear gain, was never imagined. The additional power consumed in driving the water through the coiled tube, and the increased retardation of the steam's exit from the cylinder in consequence of its diversion through the box, were clearly paid for it, if nothing more. So with the regenerator; its meshes of wire perform the part of the coiled pipe, but more perfectly because they mix directly and more intimately with the fluid to be heated; still, in proportion as they do this, they retard the air's passage through them. If it oozed through layers of finely-granulated metal—fine as that used in place of sand in ships' hour-glasses—it would give out and take up heat still more readily; but then its passage would be more obstructed than by the metallic gauze, and more power would be expended in driving it through.

* * * *

It may not be agreeable to believers in the alleged powers of the caloric engine to have it associated with attempts at perpetual motion, but if the claims respecting the virtue of the regenerator are just—if by it the same power is actually used over and over—the old popular fallacy is, or is about to be, a great modern truth, and the greatest of all mechanical truths; for by it power barely sufficient to forge a nail, may, in time, be kept going till it fabricates tons, and heat that once drives a vessel over the Atlantic or locomotive over a railroad, will suffice to propel them to and fro for an indefinite number of trips. Losses by leakage, radiation, &c., be it remembered, affect not the *principle*. They are incidental difficulties that may be overcome. What, then, if the principle affirmed *be* true, is there to prevent power expended in sawing a plank, making a shoe, weaving a carpet, ploughing fields, &c., from going on producing and ploughing; or the labour expended on the erection of a house, from building a city, or when a mile of railroad is once made, from the same power continuing it round the globe?

Captain E., it may be said, dreams of no such things. Suppose he does not: it is not the less true that these are natural and unavoidable deductions from his proposition. It is the principle that is in question. Establish the fact that mechanical force *can* be made to repeat itself, and no matter to what extent—large or little—Captain E. or any one else has carried, or may carry, it out. But Captain E. and his friends do contemplate the performances of miracles akin to those named: they expressly assert of the caloric engine, "its object is the production of a continued force almost without reference to the amount of the original exciting cause." The "almost" being inserted to meet small deductions arising from practical imperfections. M. Foucault, the celebrated inventor of the Pendulum experiment, for rendering the rotation of the earth visible, thinks the caloric engine "has conquered a great principle," and that it "all but leads to the conviction that the perpetual motion is at last discovered."

The repeated or continued use of the same power is the essence of the perpetual motion; and while not one seeker has found it, every one thinks he has got nearer to it according to the per centage of power he has gained, or, in other words, "used over and over." Now the fact is, that *any* portion, large or small, thus gained, is equal to gaining the whole. When 90 per cent. of power is used, say only *once* over, 180 will have been got out of 100. And if one or one-tenth of one per cent. be "used over and over again," the same miraculous result follows—a part will be found greater than the whole—and infinitely greater, too.

But, as we observed, there is no making pounds out of pennies in the currency of

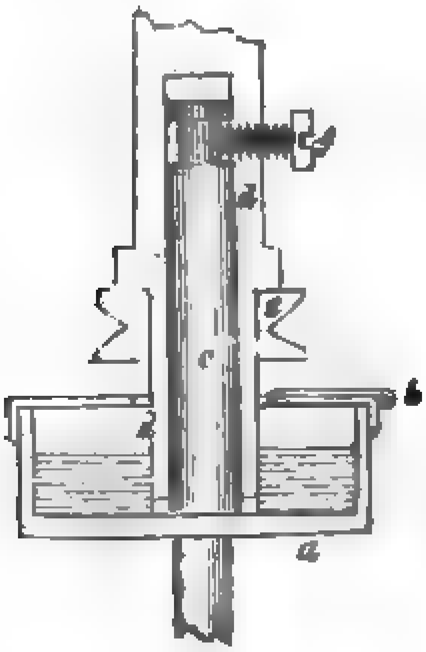
force: capital in it carries no interest—neither simple nor compound.

## MOHLER'S PATENT LUBRICATING MACHINERY.

(Patent dated February 2, 1854.)

M. Mohler, of Obernay, France, has patented apparatus for lubricating machinery, constructed in such manner that the lubricating liquid is raised and brought in contact with the rubbing surfaces by capillary attraction in conjunction with the motion of the moving parts. Fig. 1 of the

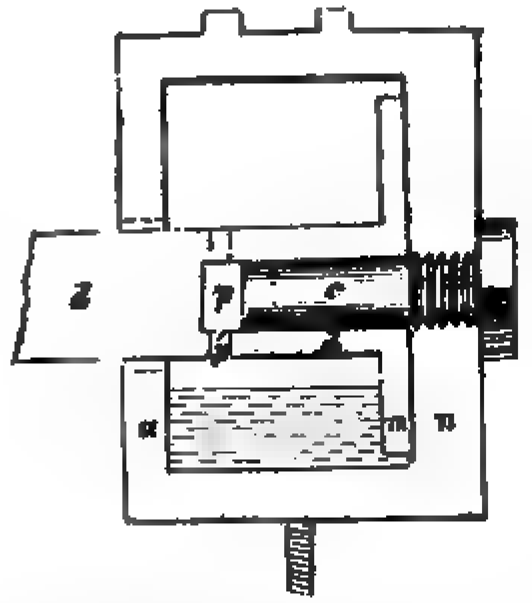
Fig. 1.



accompanying engravings is a vertical section of the bearing of a vertical spindle or shaft provided with his lubricating apparatus. *a* is a box or cup containing oil, and provided with a cover, *b*; *c* is a fixed cylindrical pin or stud, on which is fitted the collar or socket, *d*, which forms the lower end of the vertical shaft or spindle; *e* is a pulley for giving motion to the spindle, which may, however, be driven by any other suitable means; *f* is a screw-pin, which enters a notch or groove in the stud, *c*, and prevents the collar, *d*, from rising up on the stud. "The revolution of the collar, *d*, and the capillary attraction between the collar and stud, *c*, cause the oil to ascend and descend between the collar and the stud, and these parts are thus kept constantly bathed with oil." To facilitate the flow of the oil the bottom of the collar, *d*, may be furnished with notches, as shown, and a passage may be formed down the centre of the stud, *c*, with a lateral aperture into the oil cup; or in lieu of forming the passage in the interior of the stud, it may consist of a groove in the side of the stud, or of a flat surface formed on the side of the stud.

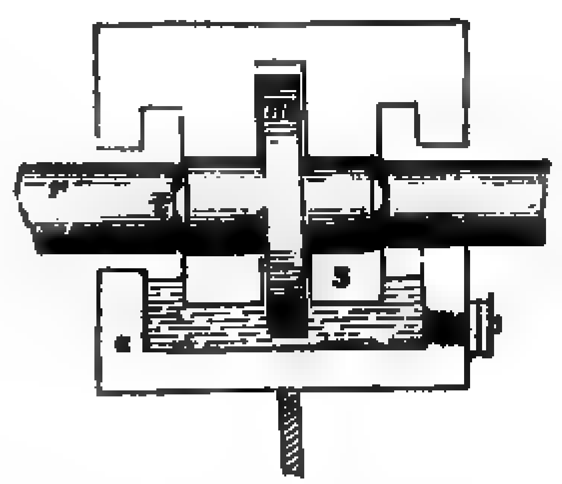
Fig. 2 is a vertical section of a portion

Fig. 2.



of a horizontal shaft, fitted with the lubricating apparatus. The shaft terminates in a socket or collar, *d* (as in fig. 1), which is furnished with a disc, *m*, dipping into the oil in the box, *a*, and running in contact or close proximity with one of the sides, *n*, of the oil cup; *c* is the fixed stud which fits into the collar, *d*, and is firmly fixed to the box, *a*. The oil is raised by the capillary attraction between the disc and the side, *n*, of the box, assisted by the motion of the disc, and it passes along the stud, *c*, and the interior of the collar, *d*, whence it escapes at the aperture, *p*, and again falls into the box, *a*. Fig. 3 is a vertical section of

Fig. 3.



another arrangement for lubricating a horizontal shaft. *r* is a horizontal shaft which carries a disc, *m*, working in a cavity or chamber in the bearing, *s*, and dipping into the oil cup, *a*. The oil is raised by the

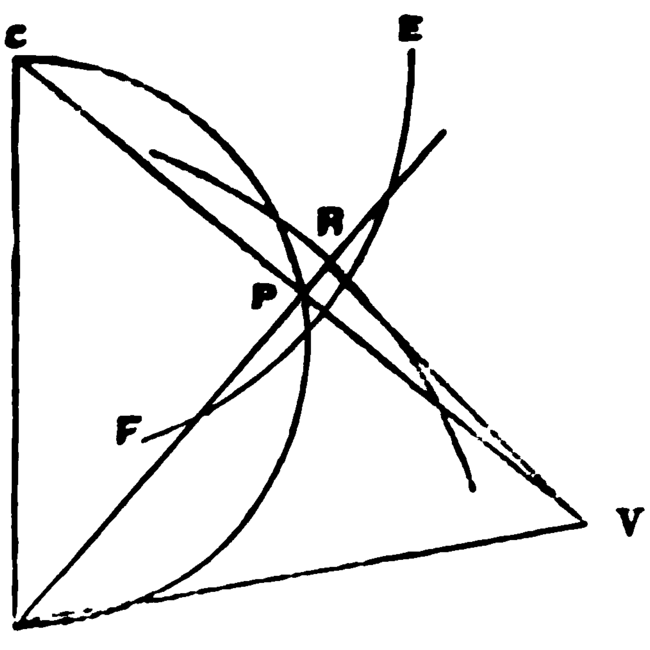
capillary attraction between the disc, *m*, and the sides of the chamber in the bearing, *s*, assisted by the motion of the disc. The oil passes along the shaft and falls again into the oil cup; *t*, *t*, are grooves turned in the shaft, *r*, to prevent the oil from travelling along the shaft beyond the oil cup. The disc, *m*, may have curved grooves in the sides, to enable it to raise the oil in greater quantity, and its edge may be either plain or serrated. Different arrangements for vertical and horizontal shafts have been described, but the lubricating apparatus may also be applied to inclined shafts, and the particular arrangement best adapted for any particular case will depend on the inclination of the shaft and the other circumstances of the case.

## A GEOGRAPHICAL METHOD OF CLEARING A LUNAR DISTANCE.

BY SIR J. W. LUBBOCK, BART., F.R.S., &c.*

By the principles of the Gnomonic projection, to delineate an arc of any given number of degrees, beginning from any given point, S, and in any given direction, SR, the following construction obtains:

Let CPV be drawn perpendicular to the




line, PR, through C, the centre of the picture, and make VP in CP produced

$$= \sqrt{D^2 + \overline{CP^2}},\ D = CB$$

being the distance of the picture. D is a constant quantity, and is to be taken of any convenient length. At V make RVS equal to the given angle. RS is the required delineation.

In order to find graphically the angles, ABC, of a spherical triangle, of which the sides, *a*, *b*, *c*, are given, we have—

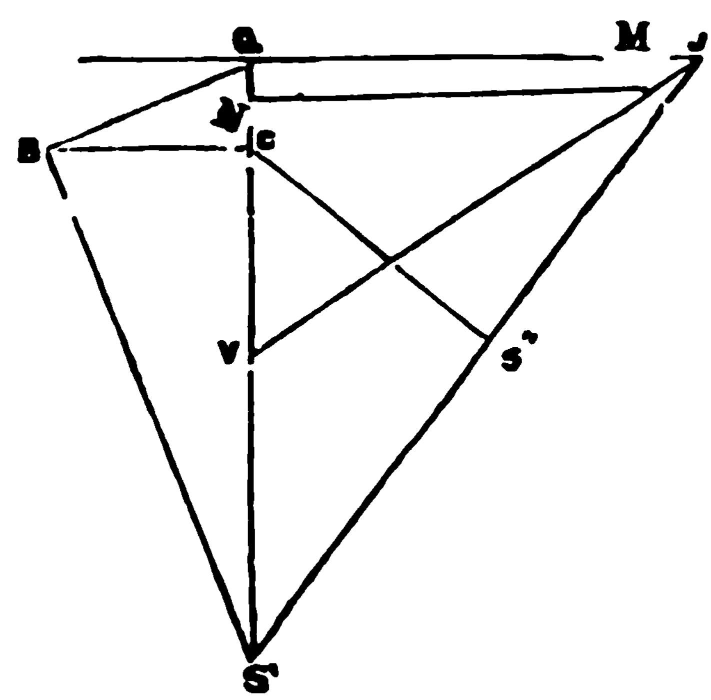
1st. To delineate the triangle correctly by the rules of perspective.

2nd. To ascertain the values of the original angles by means of their delineations in the picture.

Suppose, for example, we have the apparent zenith distances or altitudes of two stars, S′, S″, and their apparent angular distance; if we place Z, the zenith, at C, the centre of the picture, the following construction obtains for the accurate delineation of the spherical triangle, S′CS″:

Take CS′, representing the apparent zenith distance, $\zeta_1$ of S′; and CS″, representing the apparent zenith distance, $\zeta_2$ of S″, and with radius CS″ describe a circular arc, EF. CS′ and CS″ are the natural tangents of $\zeta_1$ and $\zeta_2$ to radius D.

From S′ draw any line S′P, and lay down upon it S′R, representing the angular distance, S′ S″, by the first rule. In this way one point is obtained of the conic section which represents the small circle described about S′, whose intersection with the circle, EF, described with radius, ZS″, determines the place of S″. In the same manner any number of points in the conic section may be found; but as it is easy to see very nearly where S″ is situated, it will generally be sufficient to find two points on the conic section in the presumed vicinity of S″, and the intersection of a straight line joining them with the circle will give the place of S″ very nearly. The locus of the point, P, is a circle described with radius ½S′C, and the locus with the point V is a circle described with radius, S′V, $S'V^2 = S'C^2 + D^2$. If R is near the true place of S″, S″ will be found nearly by the intersection of a circular arc described with radius S′R and the circular arc EF. S′CS″ is the accurate delineation in perspective of the spherical triangle, S′ZS″.




To measure the angle, ZS′S″, produce S′C to Q, making S′Q=90°, by making S′BQ a right angle, and CB perpendicular to CQ=D.

* Communicated by the author to the "Philosophical Magazine."

Draw QT perpendicular to S′Q, and in S′Q take

$$QV = \sqrt{D^2 + CQ^2} = BQ.$$

Produce S′S″, cutting QT in the point, T, and join VT, the original angle, ZS′S″, is equal to QVT.

As the correction in the distance for S′ is approximately equal to the correction in altitude of S′, multiplied by the cosine of the angle, QVT, on VT take from scale the correction of S′ in the altitude=VM, draw NM parallel to QT, then VN is the correction in distance on the same scale approximately.

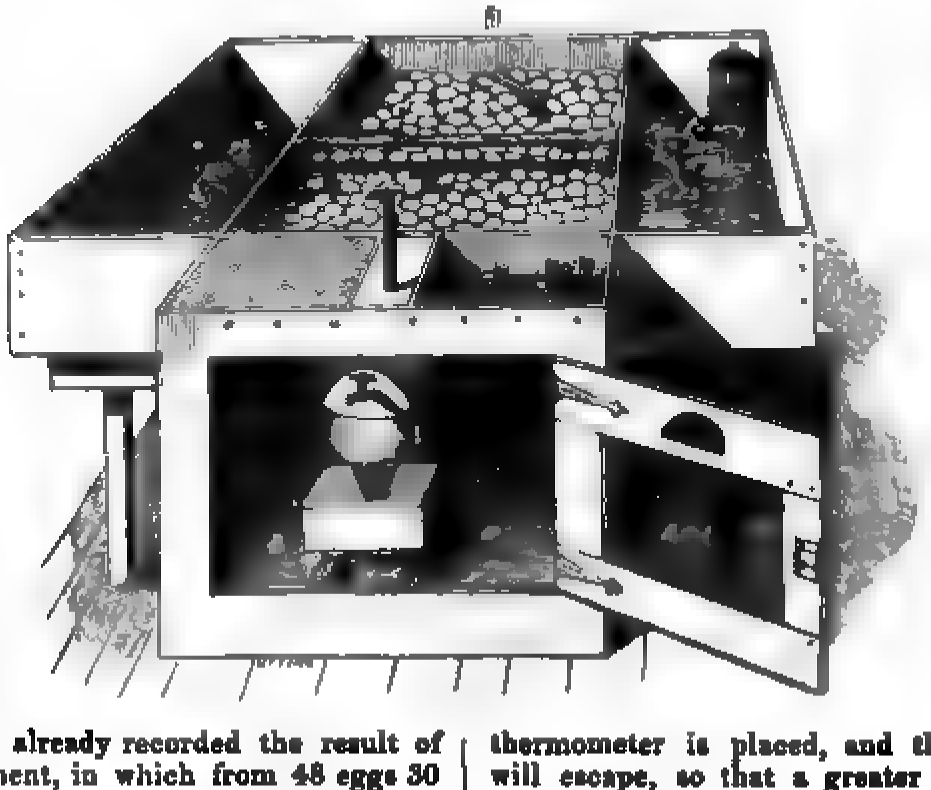
In the same way the angle, ZS″S′, may be measured, and the correction of the distance due to the error of altitude of S″ may be found.

When the point, Z, is placed at C, the centre of the picture, the angle on the picture, S′ZS″, is equal to the original angle, S′ZS″.

The point, Z, may be placed anywhere in the picture, and the proper construction may be inferred from what precedes; but then the circle described with radius ZS″ will be replaced by a conic section, and the angle, S′ZS″, will not be equal to the original angle, S′ZS″.

## MINASI'S ARTIFICIAL INCUBATOR.

At page 110, of our current volume, we published a description of Signor Carlo Minasi's Incubators, which have proved signally successful in practice, and which are becoming much sought after. We there promised to publish an engraving of the apparatus, which we accordingly subjoin. We have not thought it necessary to indicate the parts by letters of reference, since our former description will be found sufficient to aid the reader in examining the illustration.



We have already recorded the result of one experiment, in which from 48 eggs 30 chicks were produced; and we may now add, that at a subsequent experiment, undertaken for the further satisfaction of ourselves and a few others, from 60 eggs taken promiscuously, 49 young ones were brought forth. The arrangement can need no additional commendation. The following are the necessary directions for the preparation of the incubator when the hatching is to be effected, including a few additional matters of interest and importance.

" Have some water heated to about 113° or 116°, with which fill the machine: to do this effectually lift the end where the thermometer is placed, and thus the air will escape, so that a greater quantity of water can be supplied. Strew the frame in which the eggs are placed with silver-sand a quarter of an inch deep. Cut a blanket the size of the zinc tray, which lay on the top of the eggs. In order to avoid the necessity of removing the blanket, it is as well to cut a few inches out of it top and bottom, so that the thermometers may be at all times seen without trouble. Another blanket should then cover the whole of the outside of the glass frame. Place under the zinc tray some hay cut in small pieces, with a little gravel or sand, and change it every other day.

"Three thermometers are required, two to be embedded in the sand (one at the top and the other at the bottom of the machine), the third to be put in the water, and they must all three be got as near as possible to 104, but never higher.

"Place the lamp, lighted, on the stand at a distance of about three inches from the boiler, and regulate its flame so as to obtain a heat of about 104°. It will take one hour before the room, machine, sand, glass, &c., are at the same temperature, but it is always desirable to keep the machine going for two hours, to ascertain that the temperature is even before putting in the eggs. After the heat has been once regulated by the lamp, the flame should not be increased or diminished, but in the event of the loss or gain of a degree of heat, raise or lower the lamp as occasion may require, by means of the screw, level with the stand, being careful, however, when the desired heat is attained, to lower the lamp again. Should a degree or two of heat be lost during the night, and the lamp have been already raised to the greatest height obtainable, it is of little consequence and need cause no anxiety, but to gain a few degrees will most probably spoil the eggs. Should at any time the heat increase above the given temperature (104°), the glass, blanket, and lamp must be immediately removed for such space of time until you observe the thermometer in the water fall to the given temperature; then cover the eggs with the blanket and glass, and place the lamp a little lower than it previously stood.

"Having got everything at an even temperature mark the eggs on one side No 1, and on the reverse side No. 2. The date when they are placed in the machine may be marked at either end. They may then be placed on the sand with No. 1 upwards; twenty-four hours afterwards they should all be turned, so that No. 2 be upwards. The best time is about eight or nine in the morning. Do not needlessly take the eggs out of the machine. At the end of the sixth day that the eggs have been in the machine it may be ascertained if the chicken is formed or not, by darkening the room and holding them against a hole the size of a shilling cut in the shutter for the purpose, when, if the egg be gently turned, the germ will be seen to float to the top. If no germ should appear, the egg may then be considered a bad one for hatching purposes. A bit of soft leather should be placed round the hole against which the egg may be held without the fear of breaking. If the shell be a dark one, it will not be until the seventh or eighth day that this can be known. It requires a little practice before the eye becomes sufficiently experienced to detect this. The great advantage which science has over nature is here apparent; for if by the sixth day no chicken is visible, the egg may be at once removed as containing no germ, and its place filled by another. Eggs with lighter shell, such as Spanish, Poland, Sultans fowls, &c., the chicken is seen clearly after the fourth day. If at the end of twenty one days, and doubt should exist as to the vitality of the chickens then due, fill a basin nearly full of water, heated to about 104° or 106°, and place some eggs gently in it. When the water is quite still, the eggs that contain live chickens will be seen to move about, and should be immediately replaced in the machine, and allowed another day or two more. When buying eggs for hatching, have a pail of water, in which place them, and observe if they lie flat at the bottom; if they do so, they are good for hatching; but if one end rises higher than the other, they will not answer the purpose; and should they float to the surface, or near it, they are rotten. Another method of telling new-laid eggs from stale ones is, by examining them at the hole in the shutter. If there appears at the thick end a vacuum about the size of a fourpenny piece only, the egg may be considered new-laid, or only two or three days old; but if the vacuum be greater, the egg is a stale one.

"When the chicken commences to star the shell, it is better to remove it to the glass box at the end, with a little flannel laid lightly underneath, and the same to cover over it, as if allowed to remain in the sand they sometimes injure their eyes. The chicken may be allowed to remain in the glass box without food for the first twenty-four hours of their existence. They should then be removed to the artificial mother, where they will shift for themselves, and should remain for about five or six weeks. If a chicken appears weakly for the first two or three days, it is perhaps as well to put it in the glass box away from its more robust companions under the artificial mother, giving them, of course, a little food."

## SOCIETY OF ARTS.—SUBJECTS FOR PREMIUMS.

In accordance with the usual practice of the above Society, its Council have issued a list of desiderata, as subjects for premiums to be competed for during the following session. As the pressure upon our pages is very considerable, and the list is of great length, we are compelled to abstain from publishing it. Those of our readers who feel an interest in the matter, (and we hope

there are many such), will find the list published at length in the *Journal* of the Society for October 20.

## ON THE FORMATION AND COMBUSTION OF SMOKE.

[MR. MANSFIELD'S valuable letter, published in our Number for October 14th, has had the effect, as might have been anticipated, of provoking several replies, of which the following are two. As it is likely these may lead to further discussion, (which we should be unwilling to check), we think it right to request that our correspondents will endeavour to debate the question with as much candour and brevity as the nature of the subject will admit of. We desire it to be understood that we make this request *prospectively*, in order that investigations, which, if fairly and wisely conducted, must tend to spread information on a highly important subject, may not be allowed to slide into an unprofitable wrangle, as is sometimes the case under similar circumstances. Some of the statements put forth in Mr. Mansfield's and the two following letters are of much interest, and in the examination of them there need be no appeal to anything beyond philosophical, experimental, and historical data.]

*To the Editor of the Mechanics' Magazine.*

SIR,—Mr. Mansfield has taken great pains with his views on this subject, and they do him credit; but if he will refer to the new edition of Mr. C. Wye Williams' standard work on Combustion, just published by Weale, he will find the whole matter cleared up, on a broad scale, by thirty years' practical experience, illuminated by the first chemical knowledge and authority. Cold air, suitably admitted behind the bridge, is, he will there see, a complete cure of smoke; and, instead of being a practical failure, upwards of 2,000 furnaces have been adapted to the principle.

He will also find the fallacy of increasing combustion by heating the air fully discussed. To supply combustible matter with heated air, involving diminished amount of oxygen, is the surest way to diminish combustion. The various plans for heating air by the furnace itself, without any separate expenditure of fuel, is likewise fallacious. In the case Mr. Mansfield describes, it is plain, any heat the air obtained in passing through the tubes could only be derived from the gases surrounding those tubes. Whence, then, the gain? In the common phrase, it is merely robbing Peter to pay Paul. If the air is so much hotter, the gases must be so much cooler; but not even this effect takes place. The actual degree of heat imparted to so bad a conductor as air, by such means as described, is known, by experiment, to be perfectly insignificant. It is the air admitted at the bridge which removes the smoke, merely as air, not as heated air. The theory and the effect are identical with the numerous applications for the same purpose described by Mr. Williams. If Mr. Woodcock can manage to apply a casing to the tubes, so as to isolate them from the heat of the furnace, the smoke will equally disappear; or let a thermometer be inserted in these tubes, protected from radiation, to ascertain if the current of air supposed to be heated ever reaches the temperature of even 100° Fahr.

I am, Sir, yours, &c.,

DAVID MUSHET.

P.S.—Smoke must be consumed (*hibernice*) *before* it is formed, not *after*.

October 18, 1854.

*To the Editor of the Mechanics' Magazine.*

SIR,—Your correspondent (Mr. Mansfield), in his eloquent address to the speculative chimneys, has shown that it is quite possible to understand, to a certain extent, the theory of combustion, and yet not be at all aware of what has been done in the way of practice. In his description of Mr. Woodcock's arrangements of apparatus for "consuming smoke," he has, I think, entirely failed to prove its novelty in any respect; for even the features of the invention specially named, as, for instance, the peculiar arrangement of bars placed under the grate upon which the fuel is laid, and also the admission of the air to the mixing-chamber, or behind the bridge—both of them features of novelty—have been long, and as it is of course said, successfully tried, with very slight deviations; and a patent was also granted to Mr. Nasmyth for the last-mentioned improvement, a description of which has been already published in several of our scientific journals, and I will therefore beg to refer Mr. Mansfield to them for a further explanation. It would, indeed, require a curious "pen" to describe and chronicle all the various expedients that have been tried to effect the above object, from the days of Watt down to the present, in some of which we find hot air preferred and introduced; in others, again, the "doctors" say cold air is the best; in all, of course, they have been successful; so that I very

much doubt, even taking your correspondent's view, whether Mr. Woodcock has at all stumbled upon the cure for all smoky chimneys; for although he is particular in stating that he watched in vain for the appearance of dense smoke issuing out of the chimney, he does not at the same time state what temperature there was at the bottom of the chimney, or at the end of the flue. Now I think it has been proved, beyond a doubt, that although no dense smoke may be seen at the chimney tops, yet a great amount of available heat may still pass therein, and be lost. The experiments made with the use of the pyrometer from time to time, and the statistical account of which has also been published, will entirely set this subject at rest. There is one point that your correspondent, in his argument on the theory of "consuming smoke," has also overlooked, and which I will just point out to him; namely, the necessity in all arrangements for effecting the above purpose, of allowing the flame or heat arising from the products of combustion, a sufficient length of time to give out the same to the tubes or flues through which it passes. Now, were the proportion between the size of, or sectional area of the tubes or flues, in relation to the required draught, more attended to than it has hitherto been, we should have less cause to complain of the presence of smoke. It is quite contrary to the laws of nature (if I may so speak) to suppose that by merely placing the fuel upon the bars, and drawing the heat arising from the combustion of the same through the tubes as rapidly as possible, that we gain by this means all the available heat for the generation of steam. On the contrary, it is very evident, after a little consideration upon the subject, that if we mean to obtain and use all the heat generated in the furnace before passing into the chimney, we must give it time to give out the same to the tubes or flues, and we can only do so by following out the rule before mentioned. In what are termed multitubular boilers for stationary purposes, it very often occurs that little or no heat or flame enters the upper tier of tubes at all; proving, I think, that if all the effect is to be produced, we must give less draught, or reduce the number and increase the sectional area of the tubes through which the greatest amount of heat or flame will pass; and not, as is often done in practice, increase the number only, and pay no attention to the sectional area required for the proper velocity of the heat or flame passing through the tube. There is also another argument in favour of this view, and one which is well known; namely, that arising from the tendency of the greatest heat to act upon the upper curve of the flue, and not on the bottom, unless it has lost some of its heat from the action just mentioned. I will repeat, that this goes to prove that great attention should be paid to the sectional area of the tubes in proportion to the grate surface, if we wish a good result, which cannot be obtained by adding to the number only. It is useless attempting to change the natural direction of currents, which will always flow in the most direct way to the chimney, but rather take advantage of it; and by, as before stated, a sufficient sectional area, obtain all the available heat possible on its passage, the length of which ought to be also in a just proportion to the above, and to the required draught. I am quite aware I have departed a little from the point in question; but I consider the above remarks bear so closely upon the same that I feel confident you will readily excuse the delinquency.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, Oct. 17, 1854.

## ON THE CONSTRUCTION OF WAR ROCKETS.

*To the Editor of the Mechanics' Magazine.*

SIR,—Having recently occupied myself with the consideration of certain circumstances connected with the employment of rockets for purposes of warfare, I beg to offer some observations thereupon, which may serve not only to interest some of your scientific readers, but also to elicit other remarks, more important than my own, upon a subject of no inconsiderable moment.

It is a somewhat curious, but I believe an unquestioned fact, that the ordinary war rocket has been found, on many occasions, to have adopted the uncomfortable and treacherous practice of returning with full force upon those by whom it was discharged. It must be admitted by all that it is extremely undesirable that so destructive a missile should be thus capricious. Its starting-point is not, however, the only improper place at which it at times arrives; its path is frequently very erratic, and generally uncertain. It seems to me that this may be accounted for in the following manner.

The rocket, as is well known, consists of a cylindrical case containing an explosive compound, by the combustion of which a motive force is produced, and sustained through a finite space of time, the case having attached to its side a wooden rod, for the purpose of guiding the projectile,

and being furnished with a conical head of metal, which is intended to pierce the object against which the missile is directed. The parts of the rocket are, I find, so disposed, that its centre of gravity lies near to its head; and the point of application, therefore, of the motive force will, while the greater portion of the path is traversed, be in the rear of that centre. Now every one acquainted with the laws of mechanics is aware that a body acted upon by such a force, so applied, is likely at any moment, should the slightest deflection in its path occur, to be affected with a rotary motion round its centre of gravity. But it is clear that any little want of symmetry in the form of the rocket would naturally produce such an unequal resistance upon its sides as would cause the very initial deflection in the projectile which, as we have just seen, is all that is necessary to effect a total change in its course. This deflection, depending on the accidents of manufacture, is of course likely to occur in any direction, and consequently it is no matter of surprise that the rocket should commence rotating in any direction, and that it should continue to revolve, pursuing an ever-varying course, until the motive force ceases to act. But the explosive compound, and therefore the force generated by it, lasts only a second or two, which may in some cases afford time for no more than a semi-rotation of the projectile; on such occasions, then, providing the initial deflection were either horizontal or inclined upward, the rocket would necessarily return to the point from which it started.

It therefore appears that what at first seemed to be the result of pure malignity in the disposition of the projectile, really is a consequence of its defective construction. To remedy it, it is only necessary so to arrange the elements of the rocket that its centre of gravity shall be at all times posterior to the point of application of the impelling force. That this may be the case, it is clear that the rocket must be weighted in the rear of the cylindrical case, at the extremity of which the force begins to act. I have accordingly arranged plans of two or three rockets to be constructed with the improvement I have pointed out, and should you think fit to accept them for the purpose, you are welcome to lay them before your readers.

I am, Sir, yours, &c.,

ALMA.

P.S. In my improved rockets it is evident that the guiding-stick may be dispensed with as unnecessary.

[The subject of "Alma's" letter is both curious and important; but as his investigation appears to us to contain a very vitiating error, we decline for the present to publish the plans of his improved rockets. As the consideration of questions of this character is a beneficial and pleasant exercise for men of science, we prefer leaving the discussion of this subject to our correspondents; if they fail we will give our own exposition of the matter.—ED. M. M.]

## THE LOSS OF THE ARCTIC.

*To the Editor of the Mechanics' Magazine.*

SIR,—As a thick fog was the cause of the lamentable loss of lives by the collision of the *Vesta* and *Arctic* steam vessels, it is of great consequence that some means should be taken to prevent such deplorable accidents happening in future. I therefore beg your insertion of some ideas which have occurred to me on the subject, in the hope that they may be of some service.

As fogs render useless the sense of sight, sound or noise is the only substitute for signal lights that can be employed to prevent collisions. For the eye we have the most powerful magnifying powers, and why not for the ear? We have many sounds which can be heard at a moderate distance, and made use of in foggy weather; but the firing of guns are the only ones heard at a great distance, and the expenditure of gunpowder would be too great to admit of their being fired at short intervals. But we have the sounds of steam whistles, gongs, trumpets, and horns, any of which might be magnified so as to be heard afar off, if worked by steam power, and acted upon at stated intervals (say about 15 seconds, more or less). Wind machines might receive most powerful blasts from fan-blowers, or steam whistles might be made of larger dimensions than those commonly used, so as to give a tremendously loud screech: as to gongs, I am in doubt whether the expense of increasing the power of their sound would not be too great. Powerful noises I think, from what is heard of the small instrument called a watchman's rattle, might be produced by the striking of bodies against each other. In short, what I advocate, is a very powerful sound or noise, which can be heard at a great distance, so that a vessel on hearing it might instantly steer from it by placing her head in the direction from whence it came; and thus would collisions be avoided.

I may remark that the powerful engines which I propose are only recommended for steam vessels, on account of their being worked by steam. When a sailing vessel hears the sound of them, she should immediately fire a gun, if she has one, or a mus-

ket, to enable the former to steer clear of her. Two steam vessels would always hear each other's sounds if the intervals between them were not too short.

The only objection to the methods which I have mentioned is, that the weaker nerves of some of the passengers might be affected by these loud noises. However, good ear-stoppers would prevent any real mischief; but were it otherwise, is the safety of hundreds of lives to be put in jeopardy for the sake of the few with weak nerves? Custom soon reconciles people to noises; I have slept on without waking when a gun has been fired over my head. So many vessels now cross each other on the Atlantic, that collisions in fogs are sure to happen, and we shall hear of more such dreadful calamities as that which befell the unfortunate *Arctic*, if some such measures as I have mentioned be not resorted to by the ocean steam companies.

Whenever sounds are magnified to the extent I imagine they could be, I see no reason why they should not supersede the present system of fog signals by the firing of guns, and thus save the expense of gunpowder.

I am, Sir, yours, &c.,
MOLYNEUX SHULDHAM.
Commander R.N.

## THE HYDROSTATICAL INQUIRY.

*To the Editor of the Mechanics' Magazine.*

SIR,—I am much obliged to your correspondent, "T. T. W.," for calling my attention to the slight inaccuracy which crept into the concluding paragraph of my communication at page 373. From what preceded, it was evident that, in passing a barge of the dimensions stated from the higher to the lower level, exactly 100 tons of water would be transferred from the upper to the lower level. While in passing the same barge from the lower to the higher level, 200 tons of water would be so transferred. It follows, therefore, that a laden boat in *ascending* through the locks of a canal, will require 50 tons *more* water than a cork; but that in returning, that is, in *descending*, the boat will require 50 tons *less* water for its transit than the cork.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

13, Angell-terrace, Islington, Oct. 23, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

MANNING, JAMES ALEXANDER, of the Inner Temple, London, Esq. *Improvements in the treatment of sewerage.* Patent dated March 27, 1854. (No. 709.)

These improvements consist in the employment of the "soft studge," which consists essentially of basic and other sulphates of iron and alumina, as a means of separating from sewerage and other polluted liquids certain valuable fertilizing constituents contained therein.

COLLIER, GEORGE, of Halifax, York, mechanic. *Improvements in looms for weaving terry and cut pile fabrics.* Patent dated March 27, 1854. (No. 710.)

The inventor causes a tappet to press a break upon the lever over which the terry warp passes, just at the time the shed is quite open and the beat of the lay is taking place, and obviates the slackening of the terry warp, which would occur when the shed was closed and the lay had receded, in consequence of the break being upon the terry-warp lever, by having a coiled wire or other spring to act upon a rod that goes across the warp, and is caused to press the terry warp just enough to prevent its being too slack for forming a clear shed.

HODGKINSON, ALFRED, of Springfield Bleach Works, Belfast. *Improvements in bleaching linen fabrics.* Patent dated March 28, 1854. (No. 714.)

*Claim.*—Bleaching linen fabrics by first passing them through milk of lime, for the purpose of thoroughly and equally saturating them therewith, and afterwards boiling and otherwise operating upon them.

ROBERTS, JOHN, of Bruton-street, Bond-street, Middlesex, doctor of medicine. *Improvements in the construction of cabriolets.* Patent dated March 28, 1854. (No. 715.)

*Claim.*—Constructing cabriolets with two doors placed at the back, and with a seat or seats capable of being moved in such manner as to allow the passengers to ride facing or looking forwards, and to enter and leave the vehicle from behind from either door, as preferred.

FRANCIS, HENRY, of West Strand, Middlesex, engineer. *Improvements in machinery for crushing, grinding, washing, and amalgamating quartz and other matters containing gold or silver.* Patent dated March 28, 1854. (No. 716.)

In this invention "a circular or ring trough, supported on friction-rollers, is used and rotates vertically therein. On the interior of this trough is a roller, the axis of which is weighted to any desired degree by a lever and weights. Rotatory motion is communicated to the roller, or to the ring or circular trough, by any suitable power."

HAHNER, WILLIAM, of Leghorn. *Improvements in the manufacture of muriatic and sulphuric acids.* (A communication.) Patent dated March 28, 1854. (No. 717.)

*Claim.*—"The manufacture of sulphuric and muriatic acids by the action of chlorine, (obtained when manufacturing sulphate of soda or otherwise), on sulphurous acid in suitable chambers, (whether such sulphurous acid be obtained by the combustion of sulphur or by the roasting of ores.)"

HAHNER, WILLIAM, of Leghorn. *Improvements in the manufacture of alkaline sulphates, and in purifying and treating gases.* (A communication). Patent dated March 28, 1854. (No. 719.)

*Claim.*—The use of a beater or instrument in combination with a certain vessel, whereby liquids are raised into spray, for the purposes of acting on gases brought in contact with them.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the construction of millwork, and in the mode of driving the same, parts of such improvements being applicable for transmitting motive power generally.* (A communication.) Patent dated March 29, 1854. (No. 721.)

*Claims*—1. A mode of driving millstones from above instead of from below in mills of a certain class. 2. A mode of connecting the running-stone with its driving-shaft, so that the stone may be readily removed when requisite.

HARRISON, FREDERICK WILLIAM, and HENRY GRAHAM WILLIAM WAGSTAFF, of Pollard's-row, Bethnal-green, Middlesex, candle-manufacturers. *An improvement in the construction of wicks for candles.* Patent dated March 29, 1854. (No. 724.)

The inventors form the middle of the wick of plait, and the exterior of straight strands or threads laid against the plait in parallel lines, and bind the whole together by a single gimping-thread, which is lapped around the wick.

LUCEVILLIARD, JEAN FRANÇOIS, manufacturer, of Dijon, France. *Improvements in fastening or sustaining to the body the various parts or objects of body clothing, equipment, and harnessing.* Patent dated March 30, 1854. (No. 725.)

*Claims.*—1. The manufacture and application of elastic bands, frilled at one or both edges, for fastening to the body the various parts of body clothing, equipment, and harnessing. 2. The manufacture and application of elastic bands to knitted or looped fabrics, by the introduction of elastic threads of caoutchouc into such fabrics during their manufacture, for the purpose of fastening them to the body.

TOWNSEND, ELMER, of Massachusetts, United States. *An improvement in machinery for sewing cloth or other material.* (A communication.) Patent dated March 30, 1854. (No. 729.)

*Claim.*—The combination of a rotary fork thread-carrier and a hook, caused to operate in connection with a needle, for the purposes of sewing.

SANDYS, JOHN, of the Electric Telegraph Works, Upper Whitecross-street, Middlesex. *Improvements in electric telegraph instruments.* Patent dated March 30, 1854. (No. 731.)

In carrying out this invention a curved or bent magnetic needle, which moves on a suitable axis, is used. This needle is hung on its axis in such manner as to bring its poles on either side of the end of the soft metal interior of an electro magnet; hence when a current of electricity is passed in one or other direction, the poles of the magnetic needle will be attracted or repelled accordingly, and the pointer fixed to the axis will be moved in one or other direction.

PASSAVANT, PHILIP, JOHN, machine-comber, and JOHN CURE, manager, both of Bradford, York. *Improvements in machinery or apparatus for combing wool and other fibrous substances.* Patent dated March 30, 1854. (No. 733.)

This invention relates chiefly to a combing machine for which letters patent were granted to C. A. Preller in 1842, in which is employed a revolving drum, upon which series of teeth are mounted for the purpose of receiving the wool or other material from the feed-rollers. In Preller's machine the comb-drum was caused to rotate for a time only, but in the present arrangement its rotation is continuous.

SIMPSON, WILLIAM, of Birmingham, Warwick, agricultural implement maker. *Improvements in apparatus for communicating alarm-signals on railways.* Patent dated March 30, 1854. (No. 734.)

This invention consists in improvements in apparatus to be laid along the lines of railway, in connection with alarm-signals at the stations, or on the engine of a train, for the purpose of warning the officials at stations, or the drivers of engines, of the immediate proximity of a train.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of hone.* (A communication.) Patent dated March 30, 1854. (No. 737.)

*Claim.*—"Making the grinding surface of hones used for sharpening razors convex, or of portions of the surface of a sphere."

BROWN, ARCHIBALD DOUGLAS, of Glasgow, Lanark, North Britain, cabinet maker. *Improvements in beds, couches, and other articles of furniture.* Patent dated March 31, 1854. (No. 739.)

*Claim.*—A mode of strengthening bedstead frames by means of central longitudinal and transverse bars, arranged hori-

zontally and jointed to the side and end frame pieces, and to each other, by means of metallic dovetail wedge and socket joints.

HELY, ALFRED AUGUSTUS DE REGINALD, of Cannon-row, Westminster, Middlesex, civil engineer. *Certain improvements applicable in exhibiting artistical, natural, or other objects, on a large scale.* Patent dated March 31, 1854. (No. 741.)

This invention consists in "exhibiting natural, artistical, or other objects upon an enlarged scale, by means of a suitable speculum or mirror;" and in "the use of concave plates of metal or glass, or other suitable material, chemically prepared or silvered, instead of the plane plates of metal or glass now used in the camera."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *An improved manufacture of carpet.* (A communication.) Patent dated March 31, 1854. (No. 742.)

This invention consists in the manufacture of a two-ply ingrain carpet, having the lower ply composed entirely of linen or cotton, or partly of linen and partly of cotton, and the upper ply of wool, for the purpose of producing a durable and economical carpet, to be subsequently printed upon one side.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of manufacturing carpets.* (A communication.) Patent dated March 31, 1854. (No. 743.)

*Claim.*—"Weaving a cut-pile fabric (that is to say), interweaving the pile into the body of the cloth, and confining it by means of shuttle-threads above and below the foundation-warps."

THOMAS, FREDERICK SAMPSON, of Cornhill, London, gentleman. *Certain improvements in locomotive engines.* Patent dated April 1, 1854. (No. 745.)

This invention consists of certain arrangements intended—1. For collecting atmospheric air and passing it into convenient vessels or reservoirs whence it cannot escape, except for performing the offices intended. 2. For compressing the atmospheric air so collected into a highly condensed condition. 3. For heating the air by means of charcoal, or other suitable fuel, to enlarge its volume; and 4. For employing the condensed and heated air for setting a piston, and by it the driving-wheels of a locomotive, in motion.

INSHAW, JOHN, of Birmingham, Warwick, engineer, and JAMES PARKER, of Birmingham, locomotive superintendent. *An improvement or improvements in suppressing the smoke, and increasing the draught of the furnaces of locomotives and other steam-engine boilers.* Patent dated April 1, 1854. (No. 746.)

*Claims*—1. The introduction of steam into the smoke-boxes or funnels of locomotive engines by means of a pipe connected with the boiler, the said pipe being external to the boiler, and furnished with a stop-cock. 2. The introduction of steam direct from the boiler into the smoke-boxes, funnels, or chimneys of marine and stationary engines. 3. The application of steam from one locomotive at rest to the getting up of the steam of another locomotive at rest.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in breech-loading fire-arms.* (A communication.) Patent dated April 1, 1854. (No. 748.)

This invention relates—1. To a sliding-breech of novel form and construction; 2. To certain means of holding the said sliding-breech in such a position as to leave the chamber exposed, and of quickly throwing it into its place when it is necessary to close the chamber; and 3. To the giving of a certain form to the chamber for the purpose of enabling it to receive a bullet of improved construction.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Certain improvements in sewing machinery.* (A communication.) Patent dated April 1, 1854. (No. 750.)

These improvements relate—1. To the use of magnetic attraction for the purpose of keeping the shuttle in contact with the face of the shuttle-race, without the use of springs, or other such device. 2. To the use of a curved hinged cap for confining the cop of the shuttle, which cop is inverted without a spindle or spool.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in printing fabrics, and in the machinery or apparatus employed therein.* (A communication.) Patent dated April 1, 1854. (No. 752.)

*Claim.*—"The application and use of caoutchouc or gutta percha rendered hard, and either alone or in combination with each other, or of compounds wherein these materials are the principal ingredients for the production of printing surfaces."

KESTELL, WILLIAM, of Burnham, Berks. *An improvement in fixing or cementing glass to metal.* Patent dated April 1, 1854. (No. 755.)

*Claim.*—"Fixing or cementing glass to metal by pressure aided by vacuum."

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and WILLIAM WALLS, of Glasgow. *An improvement*

*in dyeing Turkey-red.* Patent dated April 1, 1854. (No. 756.)

This invention consists in employing oleic acid (distilled by preference) in the process of dyeing Turkey-red, in place of the oils heretofore used.

SCOTT, THOMAS, of Brighton, Sussex, gentleman. *Improvements in machinery for propelling.* Patent dated April 3, 1854. (No. 757.)

*Claim.*—"The construction of machinery for propelling by means of a steam cylinder and piston connected directly with a propelling cylinder and piston of larger diameter, and so arranged that the outward or propelling stroke may be produced by the pressure of the steam, while the return stroke is effected by the pressure of the atmosphere or other fluid medium."

FORSYTH, JAMES, of Caldbeck, Cumberland, spinner. *Improvements in machinery for preparing and spinning wool and other fibrous substances.* Patent dated April 3, 1854. (No. 758.)

*Claims.*—1. Certain modes of communicating the traversing motion to the doffer or doffing cylinder of machinery for carding or preparing fibrous substances. 2. Constructing machinery for preparing or spinning fibrous substances with drawing rollers, in combination with certain revolving tubes. 3. The combination of a traversing doffer, having separate rings or fillets of card with revolving tables, and a series of small rollers or pins, round which the slivers pass on leaving the doffer. 4. Constructing machinery for preparing and spinning wool and other fibrous substances at one operation, by the combination of the uniformly traversing doffer, having separate rings or fillets of card, with grip flyers or revolving tubes, and drawing rollers, and bobbins, and flyers, as described.

ASHDOWN, WILLIAM, of Piccadilly. *Improvements in gas stoves.* Patent dated April 3, 1854. (No. 760.)

*Claim.*—The construction of gas stoves with a certain mixing chamber, having a reticulated covering for receiving asbestos.

HODGES, RICHARD EDWARD, of Southampton-row, Russell-square, Middlesex. *Improvements in connecting wheels, drums, cylinders, and pulleys, with their naves, axes, and the parts thereof, one to the other.* Patent dated April 3, 1854. (No. 761.)

*Claim.*—"The application of straps or lengths of vulcanized India rubber between the naves or central parts, and the exterior or periphery, or other parts of wheels, drums, cylinders, and pulleys."

GOSSAGE, WILLIAM, of Widnes, Lancaster, manufacturing chemist. *Improvements in the manufacture of certain kinds of soap.* Patent dated April 3, 1854. (No. 762.)

*Claim*—"The application of viscous solution of soluble glass to the manufacture of certain kinds of soap, by mixing such viscous solution with genuine soap (made from tallow or rosin oil, or other such material), and thereby producing compound soaps possessing valuable detergent properties, independently of the detergent properties of the genuine soap, contained in such compound soaps."

HIGGIN, JAMES, of Manchester, Lancaster, manufacturing chemist. *Improvements in the mode or method of separating metals from each other when in conjunction, and in obtaining useful products therefrom.* Patent dated April 4, 1854. (No. 766.)

*Claims.*—1. The use of acids, either alone or mixed with an oxidyzing substance, for the separation of metallic tin or preparations of it, from scrap tin plate. 2. The use of chlorine gas, or a liquor containing chlorine, for the same purpose. 3. The separation of ammonia as a bye-product, in the process of separating tin from scrap-tin plate.

SWARBRICK, JOHN, of Baxenden, near Accrington, Lancaster, engineer and millwright. *Improvements in steam boilers.* Patent dated April 4, 1854. (No. 767.)

This invention consists in fixing a horizontal cylinder or tube inside the fire flue or flues, and connecting this cylinder or tube to the fire flues at their upper and lower parts, by vertical tubes.

BENTLEY, JOSEPH, of Liverpool, Lancaster, gun manufacturer. *Improvements in breech-loading fire-arms.* Patent dated April 4, 1854. (No. 768.)

*Claims.*—1. The application to breech-loading fire-arms of a hammer, having the limb or "comb" formed to extend below the stock frame. 2. The use of a screw ram-rod. 3. Certain general arrangements and combinations of various parts, to form a lock suitable for repeating fire-arms.

SAMUELSON, BERNHARD, of Banbury, Oxford. *Improvements in machinery for cutting turnips and other vegetable substances.* Patent dated April 4, 1854. (No. 771.)

This invention consists in making the front or cutting plate of Gardners' turnip cutters with openings and with edges, the latter to abrade, and the former to discharge the dirt from the roots.

BRISCO, ROBERT, of Low Mill-house, Saint Bees, Cumberland, Esq., and PETER SWIRES HORSMAN, of St. John's Beckermet, in the same county, gentleman. *Certain improvements in heckling machinery.* Patent dated April 4, 1854. (No. 772.)

*Claims.*—1. Certain means of effecting the intersection of the heckles of the upper and lower range, whereby the tow is carried through the strick of flax or other material.

2. Causing the top heckles to assume a vertical or nearly vertical position, in order to facilitate the operation of clearing. 3. Cranking the lower heckle bar in a peculiar manner, whereby the lower heckles are caused to enter the flax within, or nearly within, the range or line of motion of the top heckles, so as to carry the tow through the strick of flax or other material. 4. The application to Evan's heckling machine of brushes or other equivalent contrivances, whereby each heckle as it comes out of the flax may, by means of the brush attached to the immediate upper heckle bar, be cleared of the tow; also the application generally of brushes or other similar or analogous contrivances to the heckle bars of heckling machines, for the purpose of removing the tow from the heckles while in operation.

Scott, Henry Young Darracott, of Queen's-terrace, Woolwich, Kent, Captain in the Royal Engineers. *An improved mode of manufacturing cement.* Patent dated April 4, 1854. (No. 773.)

This invention mainly consists in a certain method of employing hydraulic or other mechanical pressure in the manufacture of cement.

Glassford, John Hamilton, of Glasgow, Lanark, lithographer. *Improvements in lithographic and zincographic printing.* Patent dated April 4, 1854. (No. 777.)

*Claims.*—1. The employment of an automatic cam arrangement for raising the printing surface up to the scraper. 2. A mode of lifting the counter pressure roller of lithographic and zincographic printing machines, by means of a cam acted upon by the carriage on entering under the scraper to receive the impression. 3. The application and use in lithographic and zincographic printing machines, in which the counter pressure roller is raised by the action of the carriage upon a cam movement, of an adjustable bearer piece for acting on the cam, and for limiting the scraping action to any desired portion of the printing surface.

Blatter, Henry, of Paris, France, watch-maker. *An improved mode of constructing thermometers.* Patent dated April 5, 1854. (No. 778.)

This new thermometer is constructed so as to render available for thermometric purposes the principle of the differential contraction and dilatation of metals, and consists of two strips of steel and brass united lengthwise and turned in the form of a circle.

Ross, George, of Falcon-square London, merchant. *An improved mode of preventing the alteration of bank bills from one denomination to another.* (A communication). Patent dated April 5, 1854. (No. 780.)

*Claim*—Impressing bank note or bill paper with the denomination of the bill or note to be printed thereon, by means of water-lining, or by printing thereon so that the ink is caused to penetrate and pass through the paper.

Newton, William Edward, of Chancery-lane, Middlesex, civil engineer. *Improved apparatus for printing piece goods or fabrics.* (A communication.) Patent dated April 5, 1854. (No. 781.)

This invention consists in the adaptation of a series of blocks to a table or stationary platten, the blocks being moved out upon each side of the machine to receive their colour, and then carried back and depressed upon the goods, which are fed forward over the surface of the table between each impression, a distance equal to the width or length of the blocks.

Howden, James, of Glasgow, Lanark, engineer. *Improvements in the manufacture of rivets, bolts, spikes, screw-blanks, and similar articles.* Patent dated April 5, 1854. (No. 782.)

*Claims.*—1. A mode of constructing machines for making rivets and other articles of a like nature, wherein the same camshafts are made to actuate two sets of shaping apparatus. 2. Arranging and constructing the carrying disc and adjustable counterpressure pin of rivet-making machines, so that the inner face of the stationary tubular die may always be in the same position relative to the stamping-ram, whatever may be the size of rivet made. 3. The application and use in rivet-making machines, in which the rivets are carried by a revolving disc, of an adjustable plunger piece, contrived to enter the tubular die to a determined distance at each stroke, so that different lengths of rivet may be obtained with the same tubular die, &c.

Bekaert, Constant, of Paris, Rue des Martyrs. *Improvements in machinery for doubling, twisting, and winding flax, silk, cotton, hemp, wool, and other fibrous substances.* (A communication.) Patent dated April 5, 1854. (No. 783.)

This invention consists in winding the fibre or yarn on to bobbins, and in then drawing it therefrom and winding it on other bobbins, while the first are revolving in the plane of their axes; by this means the fibre or yarn is twisted. After this, the bobbins which now contain the fibre or yarn are placed (two, three, or more together) in frames which revolve in the opposite direction to the bobbins from which the fibre or yarn was first drawn, and during the revolution the fibres or yarns are drawn from the bobbins and wound upon a web.

Harlow, Jonathan, of the Bordesley Works, Birmingham. *Improvements in the manufacture of metal bedsteads.* Patent dated April 5, 1854. (No. 784.)

This invention consists in employing a peculiar form of stop-joint for the pillars or stretchers of bedsteads. This joint consists of a plate which carries the axis (on which the pillars or stretchers turn), with two projecting pins or stops, which, coming between the two stretchers, hinder them from being opened or pressed out too far. And in making the pillars of metal bedsteads, in place of using the metal heretofore employed, the pillars or parts of them are cast of malleable cast iron, and annealed.

SMITH, STEPHEN RANDOLL, of Hanover-terrace, Cumberland-road, Bristol. *Improvements in vessels and apparatus used for raising sunken vessels and other bodies in the water, and for lowering materials for structural purposes in water.* Patent dated April 5, 1854. (No. 785.)

The inventor's apparatus, which he calls "The Central Tubular Marine-lifting Apparatus," consists of a floating vessel, constructed of wood and iron, somewhat resembling the hull of a ship, having a deck, on which the principal mechanical operations are performed, and furnished with a series of iron tubes arranged in the central line of the deck, and passing through the body of the vessels to the bottom, through which tubes chains are worked for the purpose of lifting sunken vessels, &c.

WILSON, GEORGE FRANCIS, and JAMES MONROE WHITING, of Rhode Island, United States. *Improvements in the manufacture of wood screws.* Patent dated April 5, 1854. (No. 786.)

The inventor employs a series of revolving holders or spindles, (suitable for holding screw blanks,) placed at a tangent to the periphery of a circular rotating tool, which carries numerous cutters working in a cam or guiding tract, by which, as they are brought opposite a screw blank, they are moved outwards, and brought in contact with the blank.

WESTON, JOHN, engineer and builder, of Norwood, Surrey. *Improvements in transmitting and applying motive power for propelling railway-trains, ships, boats, barges, and such like vessels, and for other useful and mechanical purposes.* Patent dated April 6, 1854. (No. 788.)

This invention consists in the use of an air-tight and elastic tube, hose, bag, web, or other covering, as a means of transmitting and applying the power or force of steam, compressed air, water, or other fluid, for propelling purposes.

SMITH, JAMES, of St. Leonard's-on-Sea, Sussex, contractor. *Improvements in the construction of railways.* Patent dated April 6, 1854. (No. 789.)

This invention consists in casting railway chairs and sleepers in one.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HIPKISS, JOSEPH, of Birmingham, Warwick, tool-maker. *A new or improved dress fastening.* Application dated March 28, 1854. (No. 711.)

This invention consists of an arrangement of parts fitted with certain tongues, slots, &c.

WOODWARD, JOHN, of Acton-street, Middlesex, office-clerk. *Certain apparatus for stopping shot and other holes in ships and vessels.* Application dated March 28, 1854. (No. 712.)

This invention consists in a peculiar apparatus, the head of which is thrust through, or into the hole, from the inside of the ship, when a spring is caused to act upon and throw out two or more arms, which have been previously covered with leather, gutta percha, or other suitable material.

ARCHEREAU, HENRI ADOLPHE, of Paris, France. *Certain improvements in galvanic batteries.* Application dated March 28, 1854. (No. 713.)

These improvements consist in rendering impervious the lower part and bottom of the porous vessels or diaphragms used in piles or batteries with two liquids, such as Daniel's, Grove's, Bunsen's, or any improvements upon these; in sheathing the elements in India-rubber; in compressing powdered blacklead, and using it instead of the ordinary carbon, &c.

CHAMBON, FRÉDÉRIC, and ALFRED MEYNIAC, of Chaylard (Ardéche), France. *Improvements in bleaching or scouring silk.* Application dated March 28, 1854. (No. 718.)

This invention consists in employing in the bleaching or scouring of silk, tartar-lees or scobs, dissolved in water, boiled, and then allowed to settle.

ROWLAND, ELLIS, of Manchester, Lancaster, engineer, and JAMES ROWLAND, of the same place, manufacturing chemist. *Improvements in the manufacture of certain metallic springs.* Application dated March 28, 1854. (No. 720.)

These improvements consist in casting coiled springs in sand or moulds in the ordinary manner in which iron castings are usually formed, instead of forming or cutting such springs out of a broad ring of metal.

BARLOW, CHARLES, of Chancery-lane, London. *Certain improvements in the permanent way of railways.* (A communication.) Application dated March 29, 1854. (No. 722.)

The inventor constructs chairs with ribs or flanges on their under side, in addition to those usually employed at the sides, for the purpose of increasing their strength,

and employs metal keys or wedges to fasten the rails into them. He also places in the jaws of chairs blocks or cushions of wood, or other elastic substance, to receive the pressure of the metal keys.

CAUSTON, ROBERT HENRY, of Battersea, Surrey. *Improvements in the manufacture of mill-bands.* Application dated March 29, 1854. (No. 723.)

"This invention, by which metallic rivets in mill-bands may be dispensed with, consists of turning up the edges or ends of a band of leather or other suitable material, and of fastening or securing these edges or ends down to the said band, by passing a slip or strip of the same material through holes made in the edges or ends so turned over and in the band itself."

CORRALL, WILLIAM, of Albert-street, Mile-end, Middlesex. *Constructing the several parts of vehicles of hollow metal tubing or pipes.* Application dated March 30, 1854. (No. 726.)

The inventor applies hollow metal tubing to the construction of the bodies, the pole shafts, and the spokes of the wheels of vehicles.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in galvanic, electric, and magnetic apparatus.* (A communication.) Application dated March 30, 1854. (No. 727.)

The plates composing the pile of the inventor's apparatus "are not all of the same size, the centre ones being large, whilst the poles are small, or the reverse, with the poles or ends large, and the central details small; or instead of this arrangement, one pole is made large and the other smaller."

TUCKER, WILLIAM, of Old Brompton, and WILLIAM ADAMS, of Kensington, Middlesex. *Preventing the escape of fuliginous smoke from shafts and flues.* Application dated March 30, 1854. (No. 728.)

The patentees construct a series of flues or shafts communicating with each other at the upper and lower portions alternately, and under the lower part of each flue, where it communicates with the next, they place a fan-wheel or blower, which is caused to revolve by any suitable contrivance, and under each fan-wheel they place a tank, into which the solid portions of the smoke are driven.

COWLEY, HENRY, of St. Giles, Oxford, builder. *The manufacture of bricks, either solid, moulded, or perforated, by improved machinery.* Application dated March 30, 1854. (No. 730.)

"The bottom of the mill," employed by the inventor, "is of a cylindrical shape, the upper surface being an incline, fluted diagonally, to receive fluted conical rollers of a screw shape, revolving on their axis, and carried round by a cylinder fixed to a central vertical shaft, which imparts a rotary motion to the rollers; a knife being fixed in an inclined position before the rollers striking the clay, and drawing it under the rollers. The clay is pressed through perforations made in the bottom into a receiving-box under the mill, and a piston is fixed to the revolving cylinder, which piston presses the clay into the mould. A stop is made to rise by means of a cam, or slotted wheel, with inclines in the slot form, the underside of the bed of the machine thereby retarding the passage of the clay in the receiver, and causing a greater pressure of clay into the mould," &c., &c.

CRAMPTON, THOMAS RUSSELL, of Buckingham-street, Strand. *Improvements in crushing, washing, and separating ores and minerals.* Application dated March 30, 1854. (No. 732.)

These improvements consist in arranging hollow drums or pans, so that when they vibrate, a ball or other weight being placed in them, will do the work required at the lowest portions of the drums or pans.

SCOTT, HENRY YOUNG DARRACOTT, of Queen's-terrace, Woolwich, Kent, Captain in the Royal Engineers. *An improved cement, applicable as a mortar or for moulding purposes.* Application dated March 30, 1854. (No. 735.)

The inventor describes the three following methods of preparing cement, either of which may be employed. 1. By calcination, so applied as to drive off only a portion of the carbonic acid contained in chalk or limestone, leaving the substance in the state of subcarbonate. 2. By subjecting ordinary quicklime or supercalcined lime to heat in the presence of carbonic acid, so as to bring it back to the state of a subcarbonate. 3. By mixing quick-lime and carbonate of lime in such proportions as to enable them to form, when properly treated, a subcarbonate. These substances are to be reduced to a powder, and mixed with hot or cold water.

WILLIS, EDWARD COOPER, of Cambridge, surgeon. *An improved mode of manufacturing gutta percha into sheets.* Application dated March 30, 1854. (No. 736.)

The inventor takes sheets of purified gutta percha, about one-eighth of an inch thick, and subjects them for a time to a bath of heated coal-tar naphtha. He then removes the sheets, and subjects them to a rolling operation in the direction of their length and breadth, until they are reduced to the desired thickness. The naphtha is afterwards driven off, and the sheets are fit for use.

COSTE, JEAN MARC GUSTAVE, of Passy, near Paris, France, chemist. *Revivifying animal charcoal that has already been used, and obtaining by a peculiar process prussiate of potasse or soda from it.* Application dated March 31, 1854. (No. 738.)

This invention has for its object—*first*, the revivification of animal charcoal which has been used in sugar refineries, &c., in order to render it again serviceable. *Second*, the extraction from such charcoal of prussiate of potasse or soda. "To obtain these results, I employ," says the inventor, "the following chemical agents: potass or soda about one part, sulphate of iron about one part, and animal charcoal (as above) about thirty parts. These ingredients or substances are to be well pulverized, and exposed to the action of caloric until they are calcined. They are then mixed with about sixty parts of water, subjected to ebullition for about half an hour, and then carefully filtered and washed: this is twice repeated. After the last filtration the animal charcoal is to be dried in a proper stove, and the liquid is to be evaporated, so as to produce the prussiates in the crystallized form."

HOMEWOOD, HENRY, and JOHN GREGORY, both of Mount-street, Lambeth, Surrey. *An improved fire-escape.* Application dated March 31, 1854. (No. 740.)

This invention mainly consists in the employment of a box or chamber which is open at the top, permanently closed at the sides and back, and temporarily closed at the front by a door, the chamber being stuffed at the sides, back, and bottom, for the comfort of persons when placed in it; and in disposing and arranging this box upon a folding frame work.

FORBES, DUNCAN, of Edinburgh, Scotland, student of divinity. *Improvements in facilitating a reference to books.* Application dated April 1, 1854. (No. 744.)

This invention consists in combining the insertion at suitable parts of a volume of a projecting index, showing at a glance the different divisions of the contents, "with the formation of an index to the contents of each leaf between each of such books or divisions on the margin of the said volume."

CLIFTON, SIR ROBERT JUCKES, of Clifton-hall, Nottingham, baronet. *An improved percussion shell.* Application dated April 1, 1854. (No. 747.)

This percussion shell is formed of cast iron, and filled with gunpowder or other suitable explosive composition, and is intended to be discharged from a cannon in exactly the same manner as an ordinary ball, being so constructed that it will penetrate the sides of a ship or other object, and explode at any given time after striking the same.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *A new and useful fabric for boot and shoe soles, machine-banding, and other purposes.* (A communication.) Application dated April 1, 1854. (No. 749.)

This fabric consists of cotton, duck, canvas, or other woven fabric, saturated with a compound of gutta percha, pitch, resin, and fatty or oleaginous matter, or with gutta percha and coal tar, or gutta percha and any pitchy or bituminous matter.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in the treatment or reduction of metallic ores and salts.* (A communication.) Application dated April 1, 1854. (No. 751.)

This invention relates to the employment "of the metallic vapours of cadmium, zinc, and mercury in the reduction of the ores and salts of magnesium, aluminum, sodium, potassium, and other earthy and alkaline metals."

SMITH, WILLIAM, of the firm of Smith, George, and Company, of Witney, Oxford, woollen-manufacturers. *An improved mop.* Application dated April 1, 1854. (No. 753.)

The inventor so arranges and attaches the absorbing material of which the mop is to be made as that both ends of each separate piece are affixed to an iron spike, to which the handle also is attached, thereby forming a series of loops.

BROCKELBANK, GEORGE, of Point, Blackheath, Kent. *Improvements in obtaining metals from ores.* Application dated April 1, 1854. (No. 754.)

The inventor employs ordinary stampers for crushing the ores, and below the stampers places a trough with inclined sides, and apertures formed at intervals to receive wire gauze. When the machine is to be worked, quicksilver is placed in the trough, the ore is supplied, and water allowed to flow in. Any ores which are not sufficiently broken by stamping are to be subsequently crushed and ground with quicksilver and water in a suitable mill.

BOBŒUF, PIERRE ALEXIS FRANCISSE, of Castle-street, London. *The application of electricity and fixed or moveable aerostation to military strategy and pyrotechny.* Application dated April 3, 1854. (No. 759.)

The inventor proposes—1. To employ balloons containing missiles and electric apparatus, the latter to be used in the transmission of the orders necessary for directing the balloon, or for loosening and inflaming the missiles raised by it. 2. To employ the gas used for inflating the balloon in projecting missiles, by means of a compressing apparatus. 3. To apply the battery to the simultaneous and instantaneous inflammation of

the various explosive matters used in pyrotechny.

WALKER, CHARLES, of Bury, Lancaster, engineer. *Improvements in steam engines, and in apparatus applicable to safety-valves for steam boilers.* Application dated April 3, 1854. (No. 764.)

This invention relates mainly to certain modifications of a reflux-valve described in the provisional specification of Henry Whittaker Butterworth, dated 13th October, 1853.

GURNEY, JOHN, of Bradford, York, woolstapler. *An improvement in machinery or apparatus for spinning wool and other fibrous materials.* Application dated April 4, 1854. (No. 765.)

This invention consists of a method of adapting bobbins to spinning-machinery. The spindles are mounted as usual, but pass freely through short tubes which rest loosely upon, or are attached to, the copping rail; over these tubes the bobbins are passed, but they are so bored out that projecting parts at their upper ends rest upon the tubes, upon which they consequently run. The bobbins are kept in central positions by means of bushes formed at their lower ends, or upon the tubes.

SEEBOHM, HENRY, of Bradford, York. *Improvements in preparing and combing wool, goats' hair, alpaca, cotton, and other fibrous materials.* Application dated April 4, 1854. (No. 769.)

In order to straighten and lay the fibres, the inventor first subjects them to the action of teeth placed upon the periphery of a series of rotating rings or discs, arranged side by side upon a common axis, so as to form, in fact, a cylinder or drum of teeth, each ring or disc of which is caused to rotate at a speed greater than that of the adjacent one on one side of it. The fibre is fed on to this combined cylinder of teeth at one portion of its surface, by feed rollers or otherwise, and drawn off at another portion by drawing-off rollers. Fibre thus prepared is then caused to travel along or through a mass of comb teeth, which have a reciprocating motion given to them, and are so arranged that the teeth travel forwards when in the fibre, and return when out of it, to give place to others acting in like manner, so that the whole or part of the teeth are changing position whilst the fibre is being combed, in order that the loops or entanglements, which are formed behind the teeth, may be liberated, and that each set of teeth may act upon the fibre.

PARKINSON, GEORGE SEABORN, of Westbourne Park-road, Middlesex, gentleman. *Improvements in railway breaks.* Application dated April 4, 1854. (No. 770.)

This break is composed of an arrangement of apparatus attached to the axle, and worked by means of an electro magnet.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improved machinery for raising and forcing fluids.* (A communication.) Application dated April 4, 1854. (No. 774.)

This invention relates to the manufacture of pumps. The pump-barrel and supply-pipe are made separate, and combined by means of an exhaust chamber, into which the water is forced by atmospheric pressure, and from which it flows, by virtue of its gravity, into the pump barrel.

CAPOUILLET, FRANÇOIS GUSTAVE BENOIT, of Brussels, Belgium, manufacturing chemist. *Improvements in apparatus for generating heat by the combustion of bituminous or resinous substances.* (A communication.) Application dated April 4, 1854. (No. 775.)

This invention mainly consists in effecting arrangements by means of which the carbon, set free by the partial combustion of bituminous or resinous substances, is collected in a soluble condition, while the explosive gases are also collected and passed off.

M'CONNELL, JAMES EDWARD, of Wolverton, Buckingham, civil engineer. *Improvements in wheels, axle-boxes, and brakes for railway carriages.* Application dated April 4, 1854. (No. 776.)

These improvements relate to the construction of wheels in one piece, from wrought-iron plate or slab, by pressure in moulds, the pressure being obtained in any convenient way; to modifications in the construction of the axle-boxes, for which Henry Vigurs obtained a patent, November 4, 1851, &c.

GILPIN, WILLIAM, of Moorgate-street, London, contractor. *Improvements in electrical communication.* Application dated April 5, 1854. (No. 779.)

These improvements consist—1. In forming a new plastic material for insulating electric telegraph wires, of certain proportions, of gutta percha, pitch or tar, rosin, and oil. 2. In a method of constructing subterranean electric telegraphs. The inventor proposes first to insulate and protect a plain metallic wire, or a wire covered with gutta percha or other insulating material, by means of one or more coatings of fibrous material, such as hemp, flax, or cotton, the said material having been rendered perfectly anhydrous by a hot solution of oil, rosin, and tar. He then lays together as many wires as may be required, in the form of a rope, and during this process passes each covered wire separately through a thick solution of tar and rosin, and presses the whole, while warm and plastic, into a solid state, &c.

GILLARD, WILLIAM RUMSEY, of Kirby-street, Middlesex, bookbinder. *An improved method of colouring and ornamenting leather, vellum, book-edges, paper, and other like substances employed in bookbinding.* Application dated April 5, 1854. (No. 787.)

This invention consists in a method of colouring the substances mentioned in the title by means of colour laid on through one or more stencil-plates.

ERRATUM.—The abstract of the Sewing-Machine Specification, No. 664, published in our last number on page 399, should have appeared on page 403, as a *Provisional* Specification.

## PROVISIONAL PROTECTIONS.

The *London Gazette* for Friday, October 20, contains no List of Provisional Protections Granted, in consequence, we believe, of the absence of the Law-officers from town. The deficiency will probably be supplied in our next number.

### PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2173. Pierre Etienne Proust, of Orleans, department of Loiret, France. A new system of apparatus for greasing or lubricating axles and other rotating portions of carriages and of machinery. October 11, 1854.

2174. Jean François Jules Alexandre Boullet, of La Chapelle St. Denis, near Paris, France. Improvements in the manufacture of steel. October 11, 1854.

2196. Anthony Bernhard Baron Von Rathen, of Wells-street, Middlesex. Improvements in bakers' and confectioners' ovens, and in furnaces or fireplaces connected therewith, parts of which improvements are applicable also to other ovens, furnaces, and stoves. October 14, 1854.

2223. Robert John Chippindall, of Rue de la Rochefocauld, Paris, France, gentleman. An improved pencil-case. October 17, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 24th,* 1854.)

1295. James Pickup. Improvements in steering-apparatus.

1322. Alfred Vincent Newton. Improvements in machinery for block-printing. A communication.

1325. John Allin Williams. Improvements in machinery or apparatus for ploughing and cultivating land.

1344. Joseph Day. An improvement or improvements in certain kinds of candlesticks.

1371. Charles Cowper. Improvements in machinery for combing cotton, wool, flax, tow, silk-waste, and other fibrous substances. A communication.

1394. Thomas Skelton. An improvement in or addition to tillers or yokes.

1426. John Gregory Jones. Improvements in apparatus for teaching addition.

1464. Joseph Marie Bardet and François Collette. An improvement in the construction of matches.

1498. James Lee Norton. Improvements in turnstile counting-apparatus.

1627. Francis Preston. Certain improvements in machinery for preparing cotton and other fibrous materials.

1715. Auguste Boissonneau. Improvements in artificial eyes.

1825. Nehemiah Brough. A new or improved dress-fastening.

1856. Julien Louis Pierre Jean Baptiste Hector Bouvet. An improved suction apparatus for pumping and exhausting purposes.

1858. William Brooke. Consuming smoke and condensing noxious and other gases and vapours, and converting the products thereof to valuable purposes, which now escape to the injury of the animal and vegetable life.

1954. Robert Adams. Improvements in breech-loading fire-arms. A communication.

2000. Robert Adams. Improvements in machinery for boring and rifling the barrels of fire-arms.

2019. William Henry Dawes. An improvement in the manufacture of iron.

2025. William Gee. An improvement or improvements in the manufacture of braces used for boring driving-screws, and other such like purposes.

2029. Victor Athanase Pierret. Improvements in watches and clocks.

2053. Samuel Elliott Hoskins. An improvement in the manufacture of paper.

2056. George McNaught. Improvements in saddletrees.

2066. Louis Cornides. A new mode of manufacturing a transparent medium, plain, printed, and coloured, of gelatine in combination with other substances.

2073. John Simon Holland. Improvements in large and small fire-arms, and in the preparation of their charges.

2084. Alfred Vincent Newton. An improvement in the rigging of sailing vessels. A communication.

2102. Arthur Boyle. Improvements in making umbrella and parasol-stretchers.

2122. William Edward Newton. Improvements in the construction of locks. A communication from Laurentius Mathias Eiler, of Copenhagen, Denmark, land-surveyor.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

### WEEKLY LIST OF PATENTS.

*Sealed October* 20, 1854.

920. William Harcourt and Joseph Harcourt.
924. Henry Bernoulli Barlow.
932. Charles Emilius Blank.
946. William Collier.
952. Edward Crosland and Thos. Boardman.
956. John Henry Johnson.
985. Carlo Minasi.
988. Désiré Plisson.
1002. John Manley.
1044. John Anthony and William Treeby Chafe.

1103. Jonathan Worthington and Fennell Allman.
1210. Léon Isidore Molinos and Charles Pronnier.
1282. Arthur Llewellyn Dawson.
1323. John Rawe the younger.
1351. George R. Chittenden.
1490. Nicholas Michael Caralli.
1638. James A. Cutting.
1694. William Edward Newton.
1706. Charles Tetley.
1732. Thomas Waterhouse.
1774. Joseph Beardmore, junior.
1780. John Coupland.
1842. William Hunter Meriwether.
1848. Charles Blunt and Joseph John William Watson.

*Sealed October* 24, 1854.

950. John Goucher.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*J. S.* and *J. R. W.*—Your communications are respectfully declined.

*J. Cross*, Birmingham.—Your best course would be to stop where you are, and study the subjects privately. You may readily obtain the necessary works from any respectable public institution.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1630.] SATURDAY, NOVEMBER 4, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## NOYE'S PATENT AMERICAN NAIL HAMMER.

Fig. 1.

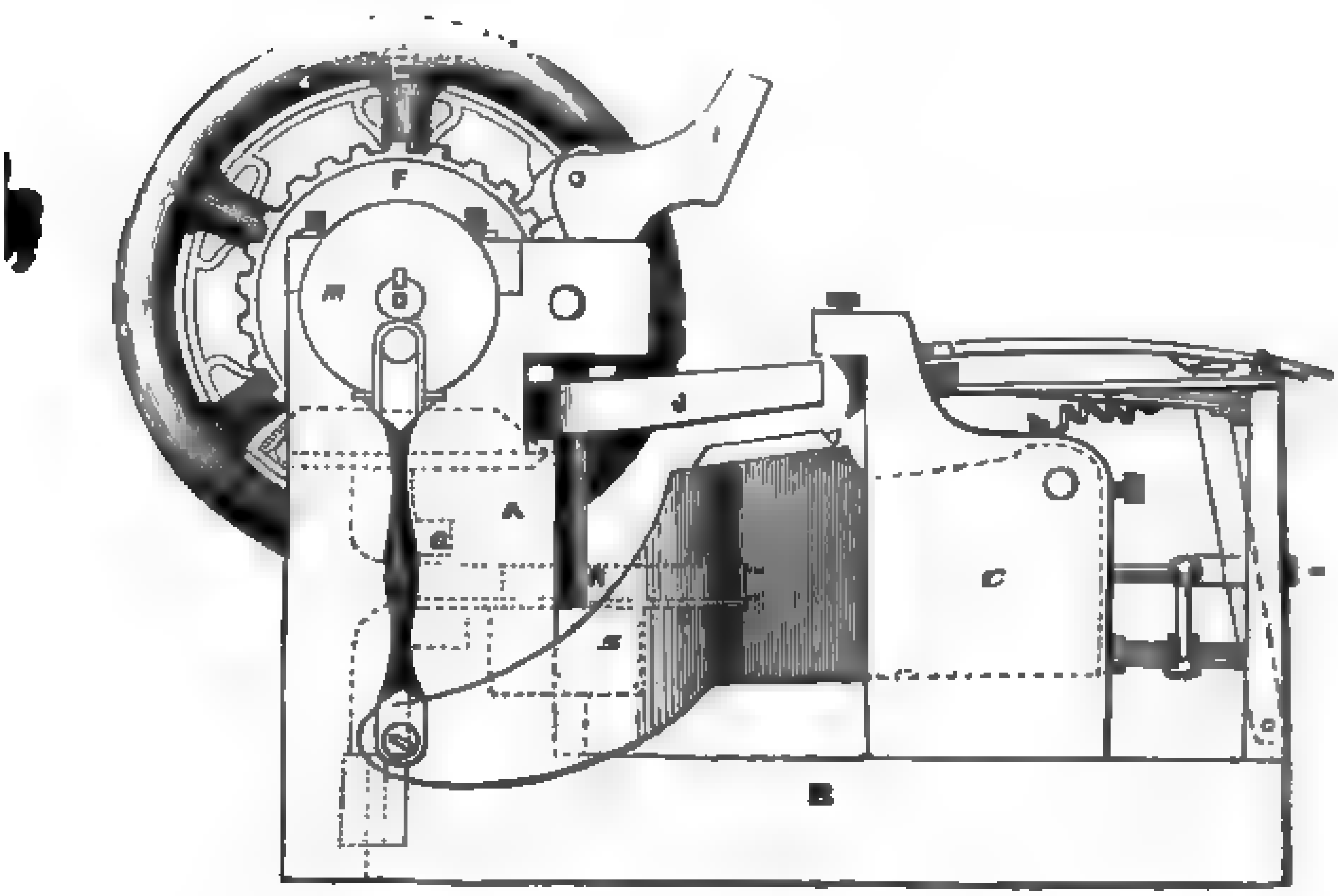
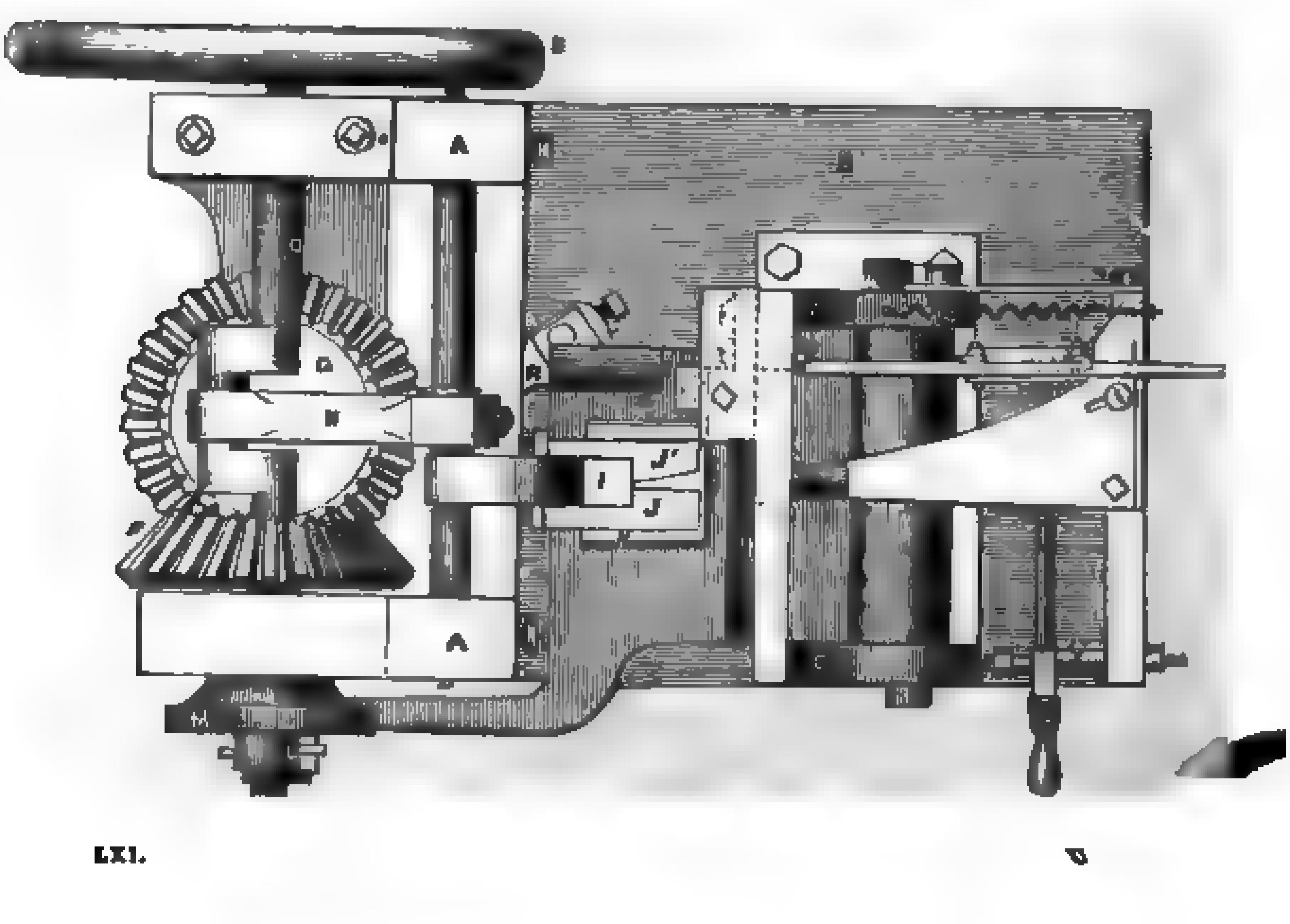



Fig. 2.



## NOYES' PATENT AMERICAN NAIL HAMMER.

The engraving on the preceding page represents an elevation and a plan of a machine for forging nails, in which the metal under operation is forcibly struck by two side hammers moving horizontally, and by an upper hammer moving about an horizontal axis, the anvil at the same time receiving a movement to enable the side hammers to strike the metal more effectively. The machine has, we believe, been patented in this country.

The *Scientific American* (from which we take the following description of the apparatus) says, "this machine is especially adapted to the hammering of wrought-iron nails, and obviates the well-grounded objection to rolled nails, which lack tenacity. If we mistake not, it is a most valuable invention, and must soon supersede all other methods for making horse-nails, especially as they can be forged very rapidly, and are more tenacious, and are smoother on their surfaces than the best English hand nail so generally used by blacksmiths. Having seen a machine in operation, we can speak unreservedly in favour of its action, and the work which it executes."

Fig. 1 is the side elevation, and fig. 2 the plan of the machine. A is the end frame, B, the bed plate, and C is a standard. The feeding machinery in this machine is the same as that commonly employed, and does not require to be described, but in a general manner. The metal to be forged into a nail is fed in on a guide way, to the action of the hammer above the top of anvil, K. D is the main driving shaft, with a fly-wheel, E, on one end. M is an eccentric plate on the main shaft; it is connected by a rod, L, to one end of the anvil, K, by a pin, and this anvil is secured on a pivot in the standard, C. F is a bevel-wheel on shaft, D, gearing into another, G, on the head of a vertical shaft, (fig. 2.) I is the top hammer, shown in fig. 1 as being raised, its arm is secured on a fulcrum shaft, which is actuated by the rod or strap, H, of the crank of the main shaft, D, as shown in both figs. It will therefore be observed that the throw of the said crank will give the hammer, I, its up and down motion to raise it from the anvil and to strike the metal to be forged, the latter act being performed when the anvil is brought into the proper position by the throw of the eccentric, M, of the rod, L, to which one end of the anvil is connected. The hammer fulcrum is so placed with regard to the ends of the connecting strap, that it (the hammer) descends with the greatest rapidity, and consequently gives a very powerful blow. This explains the action of the top hammer.

J J′ are the side hammers. Their inner ends are secured on the top of vertical spindles, N N, which carry toothed sectors, S S, gearing into one another, for the purpose of giving them both unity of action from one connecting rod. On the vertical shaft which carries the bevel wheels, G, there is a crank, Q, (see dotted lines, fig. 1,) which is secured to the connecting rod, R, by a pin, P. This connecting rod is secured at the end to a pivot or fulcrum, on the sector. It therefore has a rocking or vibratory motion given to it by the crank, Q, and makes the hammers, J J′, rapidly approach one another to strike the two sides of the nail, and then throw them apart again. The connection of the rod, R, with the crank, Q, is such relatively with respect to the side hammers, that the latter have the greatest velocity imparted to them just as they strike the blow, thus assuring the greatest applicable force at the moment required.

The top hammer strikes the metal (which is heated and fed forward on the anvil,) and at the moment when it is raised the side hammers rapidly strike, and the anvil is as rapidly depressed by its connecting rod, L, to allow the side hammers to embrace the sides of the piece of metal truly. In fig. 1, the anvil is shown depressed, the hammer, I, raised, and the side hammers acting on the piece of metal. This describes the action of the hammers. One of the most essential features of the machine consists in the relative positions of the ends of the connecting rods and fulcra of the hammers at the time of giving a blow. The fulcra are so placed as to be at the time of giving the blow nearly in a straight line with the connecting straps or rods, from which they derive motion. Just before giving the blow, in consequence of the relative position of the ends of the connecting rods, and the fulcra of the hammers, one end of the connecting rod or strap is travelling in one direction, while the opposite end attached to the transverse arm is moving in the opposite direction, which necessarily gives a rapid motion to the hammer when about to strike. When the hammer is rising and the side hammers opening, the ends of their respective connecting rods are moving in nearly the same direction, which thus gives them a slow motion at such a time. The connecting rods also, when in a straight line with the fulcra of the hammers, allow the hammer arms to turn freely forward or back on their journals at the time of giving the blow, which is essential, in order to give a swinging elastic blow.

The action of the hammers after each other—the top ones and then the side ones, is rapid and accurate. The faces of any or all of the hammers can be furnished with dies, so that any desired shape may be given to the iron, and thus various kinds of forged nails and spikes may be made by it with great facility. In some kinds of forging the upper hammer may be dispensed with, and the two side hammers used, or the two side hammers left idle, and the top one used alone. The peculiar swinging blow described, of the top hammer, renders it superior to the common trip hammer, as the anvil can be brought into position for the hammer to strike a perfectly square blow.

## PATENT CASES IN EQUITY.

### NO. I.

### ORIGINAL INVENTION OF GREASE-TIGHT RAILWAY AXLE-BOXES.

The inventive classes of this country are undoubtedly the true lords of physical progress, without whom Englishmen would be but little superior to the Chinese, repeating again and again the old till it became *effete*, and lingering behind the rest of the world, instead of being foremost in the race to win for humanity the rich prizes of civilization. And the Patent-laws are instituted in order to give to these classes a property in the fruits of their own minds, just as the law of copyright gives inventive authors a property in the fruits of theirs. It is, therefore, very desirable that we, who are professionally interested in the progress of invention, should occasionally inquire into the operation of the laws of the country upon the interests of inventors.

The late change in the Patent-laws, lowering the cost of patents, has been in some respects an advantage, and in others a disadvantage to patentees Under the old system, an inventor could patent a complex machine involving many mechanical principles, and claim that machine not merely as a whole composed of new and old parts, but also could claim new inventions in the details for other purposes; and under one patent he was at liberty to include a variety of separate and distinct inventions. Under the new law, however, he is confined to one distinct invention, applicable to but one purpose. Formerly an improved loom might contain several new features applicable to locomotive purposes; but the inventor will now have to take two distinct patents for them. It is true that the modern patent gives a right over the whole United Kingdom, whereas three separate patents were required under the old law. But then, in many cases, a patent is only available for England and Scotland, or England alone, and is of no use for Ireland. A patent for England and Scotland could be had, on the old system, for £200, and for England only, for £110. Under the present system, it will cost £175 when all the payments are complete, so that but £25 are saved in the one case, while £65 additional are required in the other. But the old patent might cover five distinct branches, or more; while five distinct patents under the new system will be required, which will cost £875, or about £500 more than the old, even including Ireland, and £765 more when the patent is only useful for England alone.

Therefore, though the new system may be better for the inventor with a single idea, and is far more profitable for the Government, and the means of increased business for agents and solicitors, the inventor abounding in ideas is far worse off than before.

But apart from this, there is another crying evil which the inventor has to undergo. It is assumed that his patent is not valid till he has contested it, and gained an action in a court of law, which, by some hocus pocus, must first pass through a court of equity, or the inventor is not in so good a position. And after he has gained his suit, he is not safe: for he is exposed to new attacks, and the patent declared valid by one judge and jury, may be made invalid by a second, and valid again by a third. In short, if the patent be valuable, there may be an incessant system of attack and defence, and much swearing and counterswearing, and declaring of opinions by professional men. We believe that, by stripping away the verbiage and cloudiness that involve patent disputes, and laying the cases clearly before the disputants and the public in their simple meaning, it would be possible very often to stop the litigation. It has therefore occurred to us that the *Mechanics' Magazine*, having the public documents in hand, may, in many instances, be capable of doing all that counsel on both sides can do (and possibly more than they are willing to do at times) in stating the case, and thus placing it before a far wider tribunal than a jury of twelve men, possibly quite ignorant of the technicalities of the case before them, and obliged to base their judgment on the opinions of professional men in matters of chemical or mechanical appliances. By publishing cases from time to time *before* they come into court, instead of *after*, we may enable a whole profession, instead of a select few, to judge of the mat-

ter, and bring public opinion to bear on the equity of the case. We believe that this publicity would prevent much injustice, and we think that our brief in print will be at least as clear as the paper folios carried in blue bags, and certainly we shall at least be quite in earnest in our desire to ferret out the truth. We do not, however, intend by these remarks to join in a mere hackneyed cry against lawyers. Expounders of laws and defenders of rights in the forum are in a morally higher position than the defenders of right in the field, inasmuch as mind is before matter, and will always reap a higher rate of remuneration. But the process of ruining a client in order to obtain, at most, 10 per cent. on the general bill of costs, is very like "killing the goose for the sake of the golden egg." High-minded lawyers are really as much interested as inventors in obtaining justice at a cheap rate—that is, unclogged by trickery of the same unworthy kind that distinguishes disputes about horses. It is not a seemly thing that barristers in court should taunt engineers with venality, nor that high-minded lawyers should suffer by the venal practices of the low-minded.

To begin at the beginning, we will first explain what a patent is. Inventions may be divided into two classes,—one comprising inventions proper, wherein the inventor by thought and speculation imagines a theory based on a principle not before applied, and works that into a system of practical detail,—the other including mere contrivances, wherein a casual observer, seeing a defect in the working of a machine, on some well known principle, applies a remedy. In either case the law gives a monopoly to make, use, exercise, and vend the object invented for the term of fourteen years, in consideration, that the inventor shall deposit in the public archives such a record as will enable men of moderate abilities in the peculiar branch to reproduce the invention, if it become lost. In case of an invention involving the application or practical use of a new principle which the inventor has specified to the best of his ability and knowledge, not designedly keeping any part secret, the law protects him in the monopoly, even though the method he has shown may not be the best method. If any other inventor or improver invents a better method, the first inventor cannot use that better method without the improver's sanction; neither can the improver use his improvement without the original inventor's sanction, till the first patent has expired. A second, a third, a fourth, and fifth improver, may also invent new and improved methods, but they are all subject to the original right of the first inventor.

It is objected that there are cases in which the first inventor has only a glimmering of the right application of the principle, and that his specification is not practically useful; but yet he keeps others from using their really practical application of the principle. This argument cuts two ways. The original inventor might say, that the second inventor or contriver has set up an impediment to prevent him from entering his own field; and he would certainly seem to have the best of the argument; for it is easier to contrive than to invent, and we constantly see that when any new principle is enunciated in a patent, there immediately follow numerous others, like satellites round a fixed star. The man who made the first shirt was an inventor—he who applied a frill was a contriver. The shirt might be used without the frill, but the frill could not be well used without the shirt.

If the right of the first inventor was not protected, there would soon be no patents of originality, and the world would be the loser. Many methods may be applied to accomplish the same object after it has once been pointed out. Any egg could be balanced on its end, after Columbus had shown how to do it.

An apparently complicated case is now, we believe, in course of litigation, having passed through the first stage, which we will endeavour to make plain by publishing and commenting on the various specifications.

In August, 1854, William John Normanville, Peter Bruff, and Percival Moses Parsons, moved for an injunction in Chancery to restrain Charles Cave Williams, a railway carriage builder, from manufacturing certain grease-tight axle-boxes under the patent purchased by a Mr. Reeves from the original patentee, Henry Vigurs, dated November 4th, 1851.

By his affidavit, Normanville claims to be the true and original inventor of the axle-box in question, and we now give his specification: *

"As regards the axle-boxes of railway carriages, I make a shield, or diaphragm, or collar, of vulcanized India-rubber, gutta percha, leather, or other suitable elastic substance, either animal, vegetable, or mineral, of the form shown at O O, figs. 1, 2, 5, and 6, manufactured to that form for the purpose, and attached to the axle-box at its outer edge, as hereafter described. The shield or diaphragm, O O, is perforated in its centre, such perforation being cut with great care in a lathe, and to a perfectly smooth surface; to allow the passage of the journal through it, such

* We have given Normanville's specification almost entire; some unimportant sentences and unessential figures alone being omitted.

perforation is made of less diameter than the actual diameter of the journal; and by the tendency of the material of which the shield is made to collapse, it presses so closely to the journal that an air-tight joint is maintained. The material which my experience has hitherto demonstrated as most suitable for making the shield is vulcanized India-rubber, either usable on the journal by itself, or with metal, or leather, or other collars, as hereinafter described. * * * The diameter of the perforation in the said shield or diaphragm for a 4-inch axle should be 3 inches and five-eighths of an Inch; the outer diameter of the said shield should be one-eighth of an inch less that the metal disc of the axe-box into which it is to fit, and it will then be found to completely fill it. After having been stretched over the axle, the shield tapers from its centre to its outer edge, as will be seen by reference to fig. 5. For the protection of the elastic shield and behind it is placed a thin cast-iron or other metal shield, A, as shown at figs. 1 and 2, secured to the axle-box, B, by four bolts, which, being more or less tightened, presses upon the outer periphery of the elastic shield, and occasions more or less pressure as required to maintain the joint upon the axle. In adjusting this box upon the journal, no more compression should be put upon the outer diameter of the elastic shield than is necessary to make an air-tight joint; should there be more than is necessary for the above purpose, it will cause so great a pressure upon the axle that there would be considerable risk of the shield firing when the axle requires motion, and before it could become properly lubricated. To prevent an accident of the above nature, I introduce four leather washers (through which the bolts before mentioned pass between the metal shield and the box, such washers being of proper thickness to prevent the bolts being over tightened). After a period in which that portion of the elastic shield in contact with the surface of the axle has worn so much as to no longer maintain a perfect joint, these washers may be thinned so as to allow the bolts to be

Fig. 1.

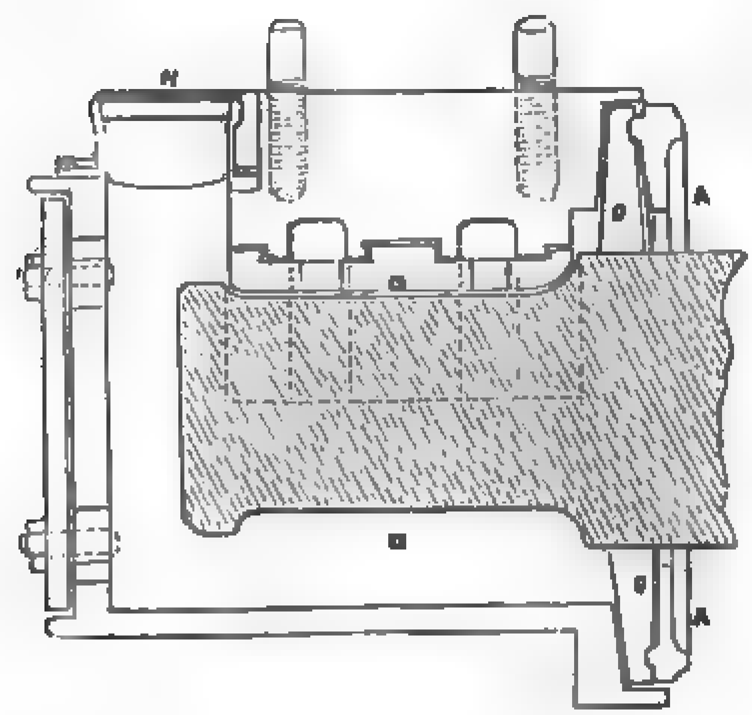
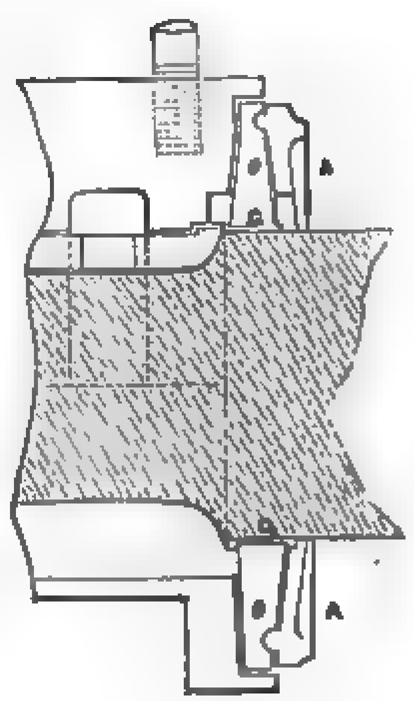


Fig. 2.



tightened, by which operation the perforation in the elastic shield will contract, and again make an air-tight joint round the axle. I show three modes of using the elastic shield; firstly, where the surface of the perforation forms the joint round the axle; secondly, where a metal collar is used; thirdly, where a leather collar is used. The first method has been partially herein before explained; it consists simply of an elastic shield, shown at O O, fig. 1, passed over the journal, D, of the axle, and secured in its position by the means already described. When, by continued wear, the air-tight joint can be no longer maintained, a loose ring of India-rubber of the same diameter as the axle, and about a quarter of an inch in thickness, may be placed upon the axle. The original shield, whose orifice has become enlarged by wear, is then stretched upon this ring, and by its contractile force clasps it so tightly that a perfect joint is maintained between the two surfaces of India-rubber, while the axle re-

volves within the inner or loose ring, and the operation of tightening by the means of the four bolts is repeated as required.

"The second modification of this arrangement consists in the introduction of a metal ring, E, in contact with the axle, as shown at figs. 4 and 5, using the contractile force of the India-rubber shield, O, to keep the ring in close contact with the polished axle. This ring should be in four parts, with the joints so arranged as to intercept the passage of the grease, and yet allow the parts to close as the surface of the ring wears; it will be obvious that this arrangement increases the expense.

"The third modification of arrangement of the elastic shield, O, and its appurtenances, and to which, from its easy application, efficiency, and cheapness, I give the preference, is the introduction of a leather ring round the axle, using the contractile force of the India-rubber, as before described, to maintain a close pressure upon the axle. The leather used for this purpose should be of the best quality, and as flexible as possible, one inch wide and a quarter of an inch thick. To prepare it for the purpose required it should be secured on to a wood mandril of the same diameter as the axle, and a groove turned out in a lathe. The said collar is shown in section at G, fig. 2, and in elevation at fig. 3.

Fig. 3.

Fig. 4.

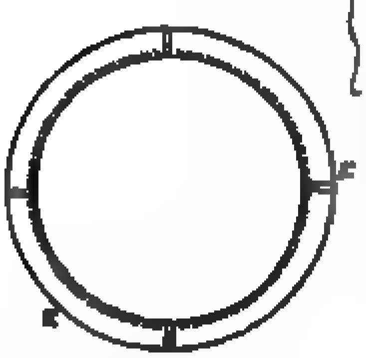


Fig. 5.

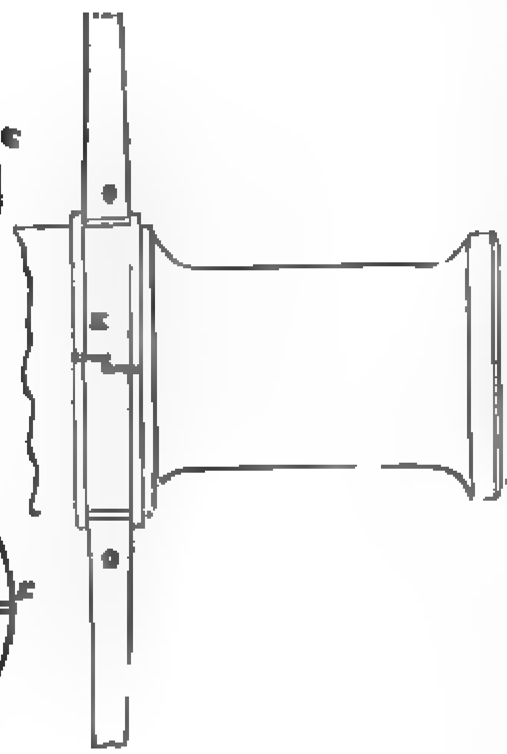


Fig. 6.

The elastic shield fitting into the groove, which is of the width of the inner surface of the perforation of the shield, keeps it in its place. When on the axle the lap-joint, as at *a*, *a*, fig. 3, allows the collar to contract as the surface of the leather wears by the rubbing of the axle. I do not turn the groove in the leather collar too smooth, as a certain degree of roughness prevents the possibility of its turning round within the elastic shield. After running a few miles, the surface of the leather grasping the axle becomes polished; but its duration, as would that of any other material, depends upon the accuracy and perfect polish of the axle revolving within it. These axle-boxes should be filled with a saponaceous grease in a semi-fluid state, so that it may flow towards the shield or collar, and lubricate it without delay, because the India-rubber or other material being in close contact with and grasping the axle, would wear and become injured should the rubbing surfaces be allowed to revolve without proper lubrication. It is not intended that free oils should be used in connection with this improved axle-box, because they would be absorbed by the India-rubber, and so injure it; while grease in ordinary use, which, however, must be in a semi-fluid state as before mentioned, may be used without injury to the elastic shield, even should the heat generated by the friction of the journal arrive at a boiling point. The top of the axle-box is of a circular form, with a lid furnished with a small air-hole screwed or hinged thereon, and so effectually enclosing the box. The grease is introduced through the aperture whenever required; this can be ascertained by touching the axle-boxes at the stations appointed, when, should undue heat be

apparent, a small quantity of grease may be added.

"I now proceed to describe another modification of the above arrangements, shown at fig. 6. It will be observed in this case that I still use the vulcanized India-rubber as a spring for maintaining an air-tight joint between the axle-box, substituting its expansive for its contractile force. I make the India-rubber in this instance a fixture; on the axle, O O, is the India-rubber collar, which must be three-sixteenths of an inch wider than the actual space it is intended to occupy, and be compressed into the position shown, and by its expansive force presses tightly on one side against the nave of the wheel, and on the other presses a brass washer, I, against a polished plate, K, fastened by four screws to the axle-box, and forming the end of it; the India-rubber collar, O, filling up the space between the two, and being a fixture upon the axle, necessarily revolves with it, and causes the brass washer to rub upon the polished surfaces of the plate forming the end of the axle-box, and effectually closes it. At the back of the brass washer I fix two small studs or pins, which press into the India-rubber, and cause the brass washers to revolve with it. The other portions of the axle-box would remain as previously described. I intend to work this modification of my arrangements with the grease in ordinary use upon railways, and commonly called 'Booth's grease,' which I find to answer the purpose exceedingly well. I do not limit or confine myself to the precise details of the methods described of making and fixing the elastic shield, or the collars described, or to the precise size thereof, or to any particular size, or to the thickness of the elastic shield, or collars, or rings, or to the material of which such shield, collars, or rings, or springs are made, as such details must be varied to suit journals of different sizes, or for other purposes or portions of machinery to which these arrangements are applicable.

"I do not claim the separate use of any of the materials or parts above mentioned and referred to, except in so far as they may be employed in combination, and for the purposes of my said invention, which I hereby declare to consist—

"Firstly, in my peculiar combination of various elastic and other materials, as hereinbefore described, with the axle-box and journal, for the purpose of rendering the lubrication of the journals of railway wheels and other moving parts of machinery more perfect.

"Secondly, in the arrangements hereinbefore described for enclosing the lubricator within a vessel which shall retain it and exclude the dirt."

There is sufficient verbiage here; but the pith and marrow of what we extract from it is "to make a shield or diaphragm or collar of vulcanised India-rubber, gutta percha, leather, or other suitable elastic substance, animal, vegetable, or mineral, attached to the axle-box at its outer edge, and by a central perforation pressing so closely to the journal that an air-tight joint is maintained," and then "shields or collars, rings and springs, are to be applied according to circumstances."

The claim, it will be observed, is, firstly, not the separate use, but "the peculiar combination of various elastic and other materials," and in all the arrangements vulcanized India-rubber is a conspicuous feature; and, secondly, enclosing the lubricator within a vessel which shall retain it and exclude the dirt.

The object is quite clear;—the grease is to be kept in, and the dirt by necessity kept out, by closing in the back of the box, so as to make an air-tight joint between the box and the axle.

By the *Railway Record* we find that the arrangement used by Mr. Normanville for some two years was vulcanised India-rubber, but that was abandoned because making lubricating matter from soap becomes "free grease," by the acid generated by the friction, which acid unites with the alkali, and when free, the grease unites with the India-rubber, when some extra heat causes it to burn like a torch. This not answering, Mr. Normanville applied what he calls the "leather shield," which was fixed to the box with a cast iron collar at the back, fastened by bolts, being in fact an arrangement not shown in the engravings.

We will now describe the principle of a grease-tight axle-box, and wherein it differs from a common one. The common box is quite open at the bottom. The grease is placed in a cistern at top, and as the axle revolves, it passes through a hole or holes, is carried round with the axle, and is delivered into the bottom of the box precisely, as the grist is delivered from the stones of a mill after passing through. Therefore a box which is efficiently closed at the bottom will prevent waste of grease, while it also keeps out the dirt.

There are two circumstances which render the "shield" mode of applying leather imperfect. First, the bearing brass wears downwards, and as it wears, an opening is formed at the lowest side of the leather collar, and the grease escapes. Secondly, the brass wears endwise, and by the tilting of the box in rough travelling, the leather collar is soon spoiled for the object in view. It is abso-

lutely necessary that there should be a flexible or elastic yielding in the collar, which closes the back opening of the box, or some provision for raising the collar when worn, so as to keep it close to the lower side of the axle, and the India-rubber would have been far the best arrangement of the two had it been chemically available. Thus far the patent of Normanville.

(*To be continued.*)

## ARE THERE MORE WORLDS THAN ONE?*

NO. I.

Amidst our editorial labours, we often feel how necessary it is for us to escape from the mere contemplation of mechanical agencies, or the grosser applications of science to the requirements of domestic and civil life. It is a relief to us to know, therefore, that the highest principles of Æsthetics are intimately associated with the forces of our material world, and that, consequently, it is our duty, not only to record the victories of the mind over a reluctant nature, but also to see that, in giving shape to our discoveries, we conserve the laws of beauty, and, to a just extent, meet all the requisitions of the human heart. We know that Art may secure from a block of common marble—a part of which is to be worked up into the home of the prattling Athenian—the ideal forms immortalized in the Parthenon by the hand of a Phidias; and if, moving in our humble sphere, we *must* set down the patented utilities of modern civilization; we *may* also attempt to refine the workman, whose successes we record, and on whose destiny, it is easy to believe, the welfare of the next generation will chiefly depend.

Every now and then, too, the crude accumulations of the mere observer, the abstract speculations of the philosopher, or the merest dreams of an idle theorist, have come to our assistance. The geologists, for example, hammer in hand and grimy in look, have piled up their facts, apparently disconnected and sweeping over the surface of the entire globe, until they threaten to crush our memories beneath ponderous "contributions" made to their favourite societies. Then happily appears some generalizing spirit, that by the touch of genius reduces the huge mass into order, and throws around it the charm of a refined intelligence. And so with the Astronomer. He observes planets, follows or anticipates the track of a comet, and calculates the most minute disturbances in the solar system, and even adventures beyond, as if ambitious to embrace all the mysteries framed by the Divine hand. Here, again, we are wearied with the reiteration of processes, or the naked announcement of discoveries, and are thankful to Providence when a Newton or a Herschel may demonstrate that all the observations gathered from the remotest corners of "the vast complex machine," are held together by the simple principles governing our own procedure in daily life, and connecting us, nevertheless, with all the destinies of the universe! Nor are the hair-brained speculations of the enthusiast without their value in our estimate of mental progress. A Hutchinson, or even a Swedenborg, may lose himself in disquisitions on the hidden meanings he sees beneath the phenomena of the material world, and yet, through the discussions necessitated by the impertinences obtruded on our attention, we may get clearer views of the boundaries separating theological dogmas from the domains of science, and, better still for our purpose, here collect, from the aberrations of gifted minds, the suggestive warnings that are invaluable to us in an educationary point of view.

Yet, notwithstanding the pleasure derived from the sources of contemplation before indicated, and the lessons secured in studying the follies of the past, we are still called back to our ordinary duties by the reflection that the principles of the Inductive philosophy (embodied, more or less, as we must suppose, in our numerous readers,) exact from us an impartial estimate of the labours of the more daring spirits of our age, who, dazzling by their brilliancy, may mislead the unwary speculatist. For ourselves, we must feel that the health of the mind consists in the proper balance of the speculative with the practical; and from others, however arrogant in their approaches to our critical chair, we must demand the calm discussion and the high-minded tone of thinking, which are so dignified in themselves, and so necessary as a mark of respect to the intelligent public they presume to address. Kepler may discover the harmonious laws of the celestial orbs, but we must not dream about the music of the spheres, and we are to forsake him altogether as a guide if he would inculcate astrological errors, or expend a mighty intellect in the vagaries of a purblind superstition, or on the pursuits of an ever credulous vanity.

Not that we much fear excesses of this sort in our own times; our danger lies, perhaps, in the very opposite direction, where,

* I.—"Of the Plurality of Worlds: an Essay, also a Dialogue on the same subject. The Third Edition. London: J. W. Parker. 1854."

II.—"More Worlds than One—the Creed of the Philosopher and the Hope of the Christian. By Sir David Brewster, K.H., M.A., D.C.L., &c., &c. Third Thousand, corrected and greatly enlarged. London: John Murray. 1854."

according to some, we are sinking down to the spirit of a mere engineer, whose gospel is an equation and whose reward the solid "fee," showing the respect of the multitude for "practical talent." But justice is even-handed notwithstanding. If urged by no exalted motives, men ignorant of the first principles of mechanics, will set themselves up for discoverers, and so fall—not by our seeking—under our sometimes too reluctant lash; we must stand upon our guard when contemplating the more pretentious advances of others who ought to be better instructed. We are bound to weigh impartially any attempt to hold the facts of science together by theory or speculation, not only because we know by long experience how easy, and sometimes delightful, it is to break away from the unostentatious pursuits of truth, but also because an ill-conducted speculation may, for reasons easily suggested, occasion an immense deal of harm in a generation which is almost forsaking, we fear, the more difficult studies of an abstract philosophy once pursued for their own sake. In the former case, a dolt may lose his time and squander his money on some specious folly or "patented" impertinence, while in the latter, the advance of a calm and unpretending Philosophy may be impeded for centuries. The curious automata we have read of, wondering at the strenuous idleness of the secluded student who framed them, are generally forgotten with the inventor, or, at best, locked up in the dusty cabinets of the curious; but the speculations of an Aristotle may cramp the intellect for ages, and require the mighty throes of a Reformation to free the minds and hearts of men from the tyrannical authority established under his name.

Nor, even if the most important end of a true criticism be to remind us of the little we really know, are we to suppose, on that account, we are to sit down in sullen inaction, or to check the most spirited attempt to throw off the shackles of mere facts, unsubordinated to the principles that gave them both life and significance. Let men think; let them push out their researches to the very limit of "the knowable" in each successive age: but let them stop there, and show the true philosopher by the self-restraint which tempers enthusiasm, and the moderation which can resist the puerile aspiration after a vulgar notoriety.

Such were some of our reflections on perusing the works included in the present notice; and we are sure our intelligent readers will forgive us, if we have anticipated remarks which must occur to every thoughtful investigator of the subject we have set ourselves to examine, with all the care it may naturally require, but at the same time with all the impartiality it demands at the hands of the critic.

The discussion itself, originated by the Work entitled, "Of the Plurality of Worlds," has attracted, as the reader is aware, no inconsiderable degree of attention: our reviews, larger or smaller, have been engaged on it for some time past; our chief scientific journals have thought it necessary to supply the public mind with information on the subject; and even our peripatetic philosophers—the lecturers—those purveyors to the popular taste, have caught up the exciting theme, in order to reduce it down to the level of, what we are sorry to disignate, the morbid longing for the amusements of science in our Mechanics' and Literary Institutes. As regards ourselves, we have exercised a little more patience, holding back till we could more clearly catch the meaning, and understand the tendencies, of a controversy in which personally we can find no interest whatever. And even now, when duty obliges us to take up our pen, we must acknowledge, that we contemplate the subject as of importance chiefly because it will assist us to indicate our real advance in the application of inductive reasoning, and show the efficiency, or perhaps, we might have said, the inefficiency, of the educational schemes prevalent among us, and adopted by professional men, or patronised by public opinion. For we cannot help feeling, in opposition to much that we have heard or read to the contrary, that, practically considered, the topic under debate is of secondary consideration. Assuming the question in dispute decided in the affirmative—that is, assuming our reader contends for a plurality of worlds; still his opinion must (we venture to suggest) take the shape of mere speculation, it being impossible to determine the precise nature of the intelligences to which he would allot "the homes of many mansions" he thinks he discovers among the glorious orbs above him. If, on the other hand, he adopt the negative view of the case, he will find himself thrown back on the thought, that our duty to our own little world—our first home, and our last grave—is the chief concern of man, while investigating its secrets, or enjoying its manifold beauties. So that, surely, learned men can afford to be calm and modest too, when they gather up the result of their researches on the points in dispute!

We say, then, again, that we shall take these books as illustrations of something more important to us than the exciting topic itself, although we shall attempt to dispose of that in the dispassionate temper befitting a scientific journal. We want to get at the spirit of the age by the study of

these works, and, any temporary excitement they may occasion being forgotten, to point out something that may compensate us for the close investigation of a subject long since agitated, and on which the present discussion has really thrown no new lights whatever, except, perhaps, in reference to the more modern geological researches.

Let the candid reader observe how the matter really comes before him. Here are two writers, taking, if report be true, the highest position in the Republic of Letters. One of them is the representative of academic culture in England,* the author of several works on mathematical and moral topics, and, above all, for years the diligent student of the history and philosophy of the Inductive Sciences; the other may be regarded as the pet of our Modern Athens, himself a discoverer in several walks of experimental physics, and having much to do, they say, with forming and directing the public mind, especially in North Britain. Now if the subject brought under review should betray the absence of the philosophic calmness and self-negation we have a right to expect in both the disputants, or, looking at the matter in question between them, if we should miss the enlarged views and strict methods of reasoning which the names of the authors would lead us to anticipate, we may be conducted to conclusions, not anticipated by them, but remaining with the world long after they are sinking into oblivion. The author of the former work may be clever—is very clever, according to some—and Sir D. Brewster may be honoured for his attainments, and the respectability of his personal character; yet to us the interests of truth are much dearer than reputations secured by a long literary life, (but now threatened with eclipse, we believe, if speculations of a similar kind are frequently indulged in); and although when even their illustrious names shall be almost lost sight of in the *nebulæ* of writers denoting our energetic age to posterity, they may be found necessary in their place, as helping to make up the phenomena studied, they may yet be regarded as very unimportant in themselves, and truth will doubtless advance with more majestic pretensions, and attract around her more faithful expositors of her laws, or more influential illustrations of the elevating power she exerts on all really holding communion with her, and prepared to follow her self-denying precepts.

Why the former volume was published, did not at first appear to us. The subject, as our readers probably are aware, had already done duty in the *Salons* of Paris, by means of the elegant though superficial speculations of Fontenelle; it had been touched upon in passing by almost every astronomer who would show his cleverness either when abandoning himself to general views, or asserting his orthodoxy by dwelling emphatically on final causes; and, lastly, it was thought nearly exhausted in the work of the laborious Dick, who sought to condense the results of previous investigations (with a few curious additions of his own) into an agreeable popular form. Perhaps, we said to ourselves, it is all a joke—one of those cumbrous practical tricks the learned are at times disposed to indulge in, to relieve, we may suppose, the tedium of protracted studies, or, at any rate, to afford a little amusement to interested observers, not quite contracted down to the narrowness of academic habits. Clever men must be allowed these gymnastic exercises of the mind. They have contended before now, that the works of Homer, of Virgil, and of all the master spirits of antiquity, originated in the teeming brain of some poor old obscure monk of the middle ages; they have destroyed, by one sweep of their pen, all our antique reverences for early history, or heroic greatness; they have shown us (reverend men!) that pain is but a thing to laugh at, and an open pit, a mere yawning idea of a profound mind. No wonder, then, should one of the brotherhood mock at the poetry of the stars, and barely leave us our own insignificant, contemptible orb, as the only fact of importance in the universe of God!

We were compelled, however, to modify our opinion; for the reading of the book proved no joke to us, it being dull, and even heavy in style; except when attempting a few sublime flourishes, it became picturesquely absurd. As to the inconclusiveness of the arguments urged by it, we say nothing here, having to deal more at length with their several ramifications when we get rid of these more personal allusions. In fact, a book like this might be safely left to itself; for it has neither the vitality of thought, nor the vigour of composition, to secure it a very extensive influence. It is one of those works that, unendorsed by a great name, unpuffed by cringing reviewers, or unattacked by injudicious partisans of opposite opinions, would be only read by the few persons interested in speculations of the sort it seeks to recommend, and then very calmly laid aside when some fresh folly so-

* Vide *Blackwood's Magazine* for September, 1854, &c., &c. If we be wrong in ascribing the work to Dr. Whewell, we must rest our apology mainly on the mistake of the great Northern authority, who is so confident of the authorship, from internal and external evidence, as to speak of it as beyond doubt.

licited the attention. It is too academic in its unbroken level for the external world of readers, and far too sophistical (we think we shall show) in the mode of presenting the argument the author would impose on us, to make us tolerate its wearisome platitudes for the sake of some few weighty reflections to be dug up from beneath them.

The importance of the work is, however, avouched in the outcry raised against it by a brother philosopher, who will not simply rush to the rescue of the beautiful romance of a plurality of worlds, but who is prepared even to stake the hopes of a Christian (of the nineteenth century, be it recollected, and not of the age of Galileo) on a discussion that, after all, must be resolved into a just estimate of merely physical phenomena. Of course the theological bile once disturbed, we are not surprised at phrases not remarkable, to say the least, for courtesy, or becoming the tongue of so grave a philosopher. If in relation to the style of the former work, there was something ponderous, and a little unwieldy, "tending downwards to the centre," we have no reason to complain of the reply that would expose its inconsistencies, and perpetuate the remembrance of its short comings. Here, indeed, everything is almost too buoyant; not seldom darting into the clouds, as if in pursuit of the orbs it has taken under its benevolent patronage. No wonder, then, we cannot always follow it; our poor capacity having, one might say, a strange attraction for the common sense of old mother earth. The author discharges his arguments like a pyrotechnic display; we are quite surrounded by the outburst of sparkles and curious scintillations; but, we regret to add; that when we revisit the scene of operations a little after sunrise, we can only find a few scorched rocket-cases, or half-burnt sticks, that certainly did go off towards the skies, but that now cause us to smile good humouredly at the late exhilaration of our spirits, rendering the exhibition so rich a pastime to us.

Yet will this book sell better than its predecessor; or should the fashion of the day demand for both the same number of editions, it will secure a larger amount of delighted readers. It throws into its pages the necessary quantity of religious allusions, and has at its margin a choice assortment of scriptural texts. It is in these respects just the volume for certain book-clubs and literary coteries; besides, what so pleasant to find, by irrefragable proofs, a great name handed over to infidelity, even though the charitable reader should be left to speak out the fact in so many words for himself? We really fear Sir D. Brewster has written *down* to this vulgar and half-educated class, forgetting the accuracies of philosophic diction in the loose declamation that may be heard in a few conventicles on the Sabbath day, but that ought to be deprecated and censured by every honest thinker, having at heart the interests of truth. So concerned is our speculator for "the ark of God," that as soon as he finds it only touched by the sacrilegious hand of a suspected free-thinker, he rushes forth, and forgets his ancient dignity, when presented to our regards in "sober gown and stole,"—as necessary, we contend, to the philosopher, as are the "singing robes" clinging around the form of the inspired bard.

So much, then, for the honest opinions we have formed in perusing these works, and which we have been more anxious to express unequivocally here, because we have not yet seen published the sentiments frequently heard by us from the lips of thoughtful scientific men, and meriting a record in our pages, if it were merely to disturb the unanimity of applause given too often to writers, who, as the Jew dealer observed, could boast "a handle to their names." To conclude this branch of our review, we will dot down another remark or two extending beyond the mere trivial questions of propriety or elegance in style.

First, then, as to the childish love of titles and literary distinctions. You see the infirmity on the title page of Sir D. Brewster's volume, and you meet with it in both books, whenever an allusion is made to any discoverer or scientific celebrity. Poor Sir John Herschel! he ought to be the most modest of men, or his friends will crush him beneath their fulsome eulogies and empty compliments. Indeed, in this very particular we observe one of the things that must be checked, or our Societies will become the theatre for mere personal display. Let an honest man, for example, visit the British Association, or even read the reports of its proceedings, from which a great mass of the objectionable has been necessarily excluded, and he will begin to doubt whether the positive advantages secured in the intercourse of the learned among themselves are not quite counterbalanced by the vitiation of public taste, and the fashion set for testimonials and high sounding literary diplomas. And what are they, after all? Let the truth be spoken, and let them be regarded in their proper relation to the civilised man. They are to us what the red coat, or the plume of feathers, or the jingling bit of copper, is to the unhumanized savage. If the philosopher study the sciences in the presence of the Infinite; if what he knows bear a scarcely recognised proportion to what still lies undiscovered, and perhaps undis-

coverable in our present state; and if, at the very best, he is forced to contend that knowledge is but the impulse to fresh researches to be pursued for the sake of truth itself or the happiness of his fellow men: surely all that now calls up our protest is very far beneath our real pretensions in this enlightened epoch, and a great impediment thrown by our own vanity into the path of our successors. If the Great Master deemed it necessary to caution the quibbling casuists against the arrogance of personal distinctions, we have a right to demand that the true philosopher should be content with the stern simplicity of his own name, and the laborious life which makes it an honourable fact among less distinguished men.

The second remark we must hazard is, that these authors consider the public whom they are addressing the merest tyros, if even that, in scientific matters. We believe that Professor Faraday is not too severe on this subject when exposing the delusions of table turning; and yet it is most humiliating, after we have had universities, colleges, societies, institutes, and associations of all sorts, and of every conceivable name, to discover that when a learned member of some or of all of these has to communicate his profound reflections to the world, he has to repeat the very alphabet of science before he is safe in the audience he solicits from the so-called educated classes. For instance, both these writers must tell their readers all about the solar system, and all about the nomenclature and simplest theories of geology, ere they can press home upon such pupils their more abstract conclusions. Ought they not rather to feel that if the state of things be as they imply, to address works of this sort to the uninitiated or half instructed is, to say the least, a very incongruous attempt; and that the largest sale commanded by their productions, can only indicate the superficial state of public intelligence, or become a perpetuation of what teachers of their high pretensions should for ever deplore?

To conclude, for the present: we will, therefore, emphasise the observation, that in these particulars we can easily perceive the evil consequences flowing from the neglect of scientific training or teaching in our higher and lower academies, and schools, and universities. Philosophers prate and speculate as if they knew they could not be contradicted; or if opposed, that their reputation is safe among a people not habituated to think for themselves. But chiefly, as more to our present purpose, these works will manifest, we think, on impartial review how far our professed teachers have gone from the spirit of the Inductive method they imagine or declare they represent, but from which they are perpetually swerving aside; here indulging in theories without foundation in the facts of observation, and there subordinating scientific research to the prejudices of some theological school, that should have been left for ever in the prisons of the early "martyrs of science." If a new "Novum Organon" be written, there will be found quite enough in the sayings and doings of our modern sages to furnish all sorts of lessons, and apt illustrations of the fact that the *idola* destroyed in one age may be re-established in the next, although more or less disguised from the vulgar gaze by the homage of the learned. We venture to predict, however, that five-and-twenty years from our own day, works on subjects like that now passing under our eye, will be written in a better spirit, and with greater reverence for the masses of the people; or, should they come down to our present imperfect standard, will not command the remunerating sale, or the public plaudits which have been afforded to and lavished on the volumes before us.

All this we hope to make indisputable as we proceed in our critical enterprise; and until we have the pleasure of meeting our patient reader again, we would solicit a diligent perusal of the works in question, that our reasonings may be watched, as we attempt to take an unbiassed position between the controversialists, and endeavour to reduce to its proper value what they have still left unsettled, hanging literally between heaven and earth; and at the same time venture to indulge in strictures from which no name, however thickly belted with honours, shall ever deter us, but in which we hope to maintain the modesty of truth, and the integrity of a good conscience.

(*To be continued.*)

## PARKER'S PATENT SMOKE CONSUMING APPARATUS.

(Patent dated April 13, 1854.)

VARIOUS contrivances for effecting the consumption or prevention of smoke by the employment of heated air are already before the public, but the greater part of them are of such a character that considerable expense must necessarily be incurred in applying them to existing furnaces. Mr. Parker has, however, recently patented a very simple and economical plan, having the same object, but requiring neither expensive alterations in the furnace to which it is applied, nor any delay in the works connected with the furnace. It is, we believe, an arrangement of which furnace proprietors may, in numerous instances,

most economically and satisfactorily avail themselves. "I am aware," says the patentee in his specification, "that the consumption of carbonaceous gases, or smoke, by the admission of air at, or near the bridge of the furnace, has long been known and practised in furnaces *constructed for that purpose.* My improvement consists in making the smoke-consuming apparatus a separate instrument, portable and easily renewed from time to time, without requiring any preparation whatever in the furnace for its reception."

Parker's patent smoking-consuming apparatus consists simply of a moveable air-chamber, open at the bottom and perforated at the top, which can be made of any required size, and of a form suitable to that of the boiler, and the furnace to which it is to be applied. This air-chamber being placed upon the fire-bars, immediately in front of the bridge, the warm air from the ash-pit will pass up between the fire-bars through the air-chamber, and being heated in its passage will meet and mix with the carbonaceous gases as they reach the bridge of the furnace, and thus considerably promote their combustion.

This will be rendered intelligible by the following extract from Mr. Parker's specification.

"Fig. 1 is a front elevation, and fig. 2, a

Fig. 1. Fig. 2. Fig. 3.

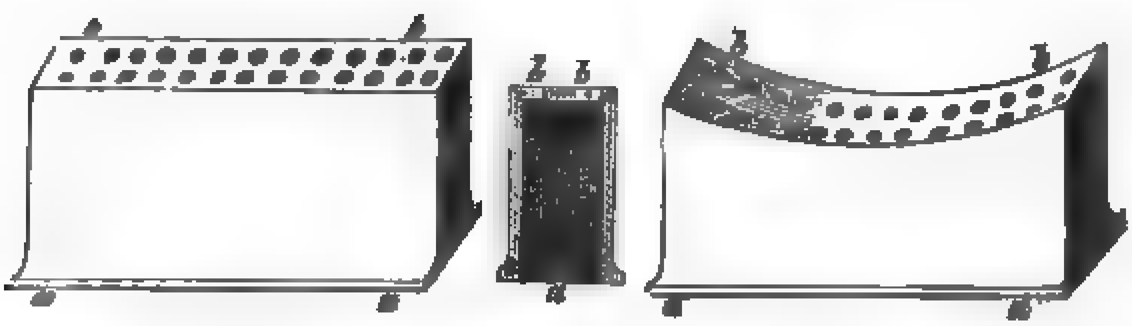


Fig. 4.

cross section of an air-chamber, suitable for the furnace of a wagon-shaped or other flat-bottomed boiler, or for an oven. Fig. 3 is a front elevation of an air-chamber, concave on its upper surface, suitable for the furnace of a cylindrical boiler. The air-chamber being placed upon the bars of the furnace, immediately in front of, and with its upper part a little higher than the bridge of the furnace, the hot air from the ash-pit passes up between the fire-bars and enters the air-chamber at *a*, and being highly heated in its passage escapes through the poles, *b b*, which may be either on the upper surface or at the back of the air-chamber. On issuing from the holes, *b b*, the heated air comes into contact and mixes with the unconsumed carbonaceous gases of the fuel, by which means they become ignited and are consumed. When the furnace has a very powerful draught, the interior of the air-chamber, instead of offering a free and straight passage to the air, as shown in fig. 2, may be furnished with stops or checks, by which the air will be detained a longer time in its passage, and be made to traverse the chamber in a circuitous direction, for the double purpose of checking its too rapid admission, and also to ensure its being sufficiently heated. Fig. 4 is a longitudinal section of so much of a furnace as is necessary to show the application of one of these air-chambers. A, is the ash-pit; B, the fire-bar; C, the air-chamber; D, the bridge of the furnace, and F, the furnace door. The hot air from the ash-pit, A,

passing up between the fire-bars, B, enters the air-chamber, C, at a, and is made to traverse round the passages formed by the alternating projections, e, as shown by the direction of the arrows, and escapes over the bridge of the furnace at b, where it mixes with the carbonaceous gases from the fuel and effects their combustion. The number and position of the projections, e, can be regulated to suit the peculiar character of the furnace to which the apparatus is to be applied."

## INSTITUTION OF CIVIL ENGINEERS:—AWARD OF MEDALS.

We observe with surprise and regret that a Telford medal has been awarded to Mr. Hobbs for the paper on Locks read by him during the last session of the Institution. We sincerely believe, indeed it is beyond doubt, that Mr. Hobbs' remarks comprised nothing of importance beyond the three following items,—*first*, some historical statements which had been already, and more fully, laid before the Institution in April, 1850, by Mr. J. Chubb, one of its own Associates, *second*, certain disparaging observations concerning Mr. Cotterill's lock, which Mr. Hobbs has since publicly shown himself, in protracted trials, quite unable to pick, and, *third*, a series of laudatory representations respecting the security of his own locks, which were immediately and repeatedly picked with perfect ease and facility. It is, to say the least, highly unbecoming, in our judgment, to reward *such* services with distinctions which cannot even be cheapened without injury to the Institution, and which certainly cannot be thus unsatisfactorily distributed without seriously damaging its reputation.

## ON THE FORMATION AND COMBUSTION OF SMOKE.

*To the Editor of the Mechanics' Magazine.*

Sir,—Your number of the 28th inst. gives two views, and a description of Woodcock's so-called "smoke-consuming furnace," to which Mr. Mansfield has referred in very favourable terms in your Magazine of the 14th. I hasten to say, that so far as it relates to effecting the combustion of coal, and the gas evolved from it in a furnace, this plan of Mr. Woodcock is identical with that of my now expired patent, of which numerous proofs may be seen in this and other towns.

I must presume that neither Mr. Mansfield nor Mr. Woodcock have read my recent publication on the "Combustion of Coal, chemically and practically considered," or they could not have overlooked the fact that the mode of introducing the air, adopted by the latter gentleman, is there explained and illustrated, and shown to be the only one by which perfect combustion can be effected, and by which smoke can be prevented.

The whole question of combustion refers exclusively, 1st, to the supplying the proper quantity of air; and, 2nd, introducing it in such a way that it shall be intimately mixed with the gas and its incandescent carbon before the temperature of the latter is reduced below that at which it will combine with the oxygen of the air.

Mr. Woodcock has introduced several additions to his furnace, which need not here be noticed, inasmuch as they offer no positive advantage, and in some respects are even injurious. The main principle and sole advantage of the plan adopted by him arises from the mode of introducing the air by means of the plate, as you have shown in the plan referred to, fixed behind the bridge, and in which, as described by him, are "a number of perforations through which the air is admitted." These words involve the entire merit of the furnace, and the means of effecting perfect combustion of the gas, and without smoke. The reasons (both chemically and practically considered) for this inference are given in such detail in my recent publication as to render it unnecessary here to add anything further.

I may, however, observe, that it is there practically proved that the introducing the air to the gas through small perforations, and in divided portions (the same as the gas is introduced to the air in the Argand burner), may, with increased advantage and greater economy, be effected at the door and as well as at the bridge; and this mode and plan of admitting the air, we may be assured, will presently become universal, both in land and marine furnaces. With your permission I will, on a future occasion, make some remarks on the letter of Mr. Mansfield. I would here observe on the error of assuming that the introduction of hot air would be advantageous, but that I find Mr. Mushet, in your last number, has sufficiently exposed it. I may, however, observe, that Mr. Mansfield himself has satisfactorily and scientifically advocated the use of cold air, enumerating, among its advantages, that "the air that passes from the grate below, not being heated, enters the fire cold, and therefore not in a rarified condition;" adding, that "by reason of its coldness, and its unrarified state, it produces a more intense and rapid combustion of the fuel."

I am, Sir, yours, &c.,

Charles Wye Williams.

Liverpool, Oct. 30, 1854.

## GLASS MERCURY TUBES.

*To the Editor of the Mechanics' Magazine.*

Sir,—We have had, for about the last six months, a glass quicksilver tube fixed in the ordinary way in the front of a steam boiler, but the inside of it, for about a foot above the surface of the mercury, having become so foul with dirt, that the firemen could scarcely see the height of the mercury, I ordered that it should be taken down and cleansed. It was accordingly removed from its position and laid upon a table, but it had lain there for no more than five or ten minutes when it began to fall into pieces of one or two inches long, as if it were quite rotten. On sending our man for a new one, the seller informed him that a similar circumstance had occurred with several others in the neighbourhood: I shall be glad if some of your readers can assign the reason.

I am, Sir, yours, &c.,
F. B. Whitaker.

Royton, Oct. 26, 1854.

[The phenomenon described by our correspondent is not an uncommon one. We have also remarked that if the end of an iron rod be passed a few times briskly along the interior of a glass tube, in contact with it, and the tube be then laid aside, the glass shortly falls into fragments, as in the case of the mercury tube.]

## CUTTING THE TEETH OF WHEELS.

*To the Editor of the Mechanics' Magazine.*

Sir,—I shall feel obliged to any of your readers or correspondents who can help me out of the following difficulty.

I am required, for some scientific purpose, to cut a wheel in 735 teeth. My engine, beside many numbered divisions on the plate, has a worm on its edge of 720, turned by means of a screw and a handle. On the end of the screw opposite the handle I can adjust locking-plates, so as to obtain different proportions of the 720; as, for instance, one turn of the locking-plate will give 720; half a turn, 360; quarter of a turn, 90; and so on to other equal proportions of the greater number on the worm-wheel; but it is evident I must now turn the worm-wheel less than one turn to obtain the number 735. I imagine a wheel might be put on, instead of the locking-plate of such a number, as would enable me, counting so many teeth, to lock at the proper point; but I am not master enough of figures to do this, and I do not know the rule, and shall be glad if your readers can help me to get over the difficulty.

I am, Sir, yours, &c.,
A Wheel-Cutter.

Clerkenwell, Oct. 25, 1854.

*Objects in Art-Manufacture. Edited by* Charles Tomlinson. *Issued to Schools by the Board of Trade Department of Science and Art.* No. 1 Paper. London: T. Harrison, 59, Pall Mall. 1854.

In a time like the present when books of all kinds, and of all degrees of merit, are thrust upon the public as aids to Education, we feel seriously bound to exercise great caution in awarding praise to new productions of this character. We have accordingly examined this first number of a series of publications now issuing under the above general heading,* with much care, and are gratified to find it well worthy of commendation. It comprises sufficiently elaborate chapters on Natural Substitutes for Paper—History of Artificial Paper—Paper-Making by Hand—Paper-Making by Machinery—Properties and Applications of Paper—and Ornamentation of Paper.

We must not omit to mention a most important feature of this series, viz., that each tract is furnished with actual specimens illustrative of the manufactures described in the text. It thus presents the well-known advantages secured by the combination of verbal and object-teaching. We recommend these papers to all to whom a very concise but lucid description of manufacturing processes will be valuable, either for purposes of self-culture, or as vehicles of instruction to others.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Devincenzi, Giuseppe, of Grosvenor-street, Middlesex, gentleman. *Improvements in producing ornamented and figured surfaces and surfaces for printing from, also the hardening or preparing certain objects to be employed in the process.* Patent dated April 3, 1854. (No. 763.)

*Claims.*—1. The employment of plates or surfaces of hard metals and alloys for receiving by pressure sunk impressions of natural or manufactured objects, such impressions being produced on the said plates or surfaces while in a softened state, and the

* We at first sight felt inclined to complain of the form of the above heading—"Objects in Art-Manufacture,"—but as we found ourselves at a loss to supply a better, we could not but refrain from taking exception to it.

plates or surfaces being subsequently hardened, so as to render them fit for printing from, either by an independent process or by the compression to which they are subjected in receiving the said impressions. 2. The employment of hard granular substances, combined or incorporated with varnish or other adhesive material, for making designs to be reproduced as sunk impressions on metallic and other surfaces, as hereinbefore described. 3. The reproduction of impressions of natural or manufactured objects, or of designs obtained either on metals or on other materials by stereotyping.

*** The above abstract should have appeared on page 425 of our last Number.

Bergue, Charles de, of Dowgate-hill, London, engineer. *Apparatus for acting on water and other liquid, so as to force, displace, or propel the same, or a body floating thereon.* Patent dated April 6, 1854. (No. 791.)

This apparatus consists of a body so rocking in the water, on a centre or axis worked to and fro, that each of its opposite sides alternately present a moving inclined face or surface to the water on which it acts. The apparatus works within a case or chamber, through which the water acted upon is caused to pass.

Nash, Joseph, of Thames-parade, Pimlico, Middlesex, chemist. *The manufacture and refining of sugar.* Patent dated April 6, 1854. (No. 792.)

*Claims.*—1. The use of certain described sugar moulds. 2. The use of silex or silica, either alone or in combination with any other matters. "Also the use of the phosphate of ammonia, and the sulphate, carbonate, or other suitable equivalent salts of ammonia having the property of precipitating lime, and the use of the phosphate of soda, as well as the said salts of ammonia, for dissolving blood or albuminous matters; all for the manufacture and refining of sugar."

O'Regan, Simon, of Liverpool, Lancaster, engineer. *Improvements in engine-boiler furnaces and other furnaces.* Patent dated April 6, 1854. (No. 793.)

This invention relates, to peculiar mechanical arrangements for admitting air to furnaces in a divided and regulated form; to the shape of the fire bars; and to constructing the brick-work and other materials suitably for the improved apparatus.

Bellford, Auguste Edouard Loradoux, of Castle-street, London. *Improvements in sewing-machines.* (A communication.) Patent dated April 6, 1854. (No. 794.)

This invention mainly consists in certain modifications of apparatus patented by W. E. Newton, October 19, 1852.

Dupont, Emile, of Boulogne-sur-Mer, France. *Improvements in the manufacture of certain cements.* Patent dated April 6, 1854. (No. 796.)

*Claims.*—1. The formation of a cement, called by the inventor "the Boulogne-sur-mer Natural Portland Cement," obtained from natural marls or limestones employed singly or in combination. 2. The employment of horizontal mills for grinding the materials employed in forming the said cement, in those cases where it is obtained from a combination of marls or limestones, or where obtained from single marls or limestones of a texture not sufficiently homogeneous. 3. The employment of the said horizontal mills in the manufacture of the ordinary artificial Portland cement from chalk and clay, separately obtained.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the construction of hot-air engines.* (A communication.) Patent dated April 6, 1854. (No. 799.)

"Great inconvenience has heretofore been experienced," says the patentee, "in the working of hot-air engines from the difficulty of obtaining a packing that will resist the great temperature to which the piston is liable to be raised. To remedy this inconvenience the inventor has adopted the plan of refrigerating the piston by means of a constant stream of cold water, which is made to circulate through its interior, and thus preserve it at a temperature not exceeding boiling water."

Bernard, Julian, of Club-chambers, Regent-street, Middlesex, gentleman. *An improved mode of stitching or uniting and ornamenting various materials, and in machinery or apparatus for the said purpose.* Patent dated April 6, 1854. (No. 800.)

This invention relates—1. To the production of a novel kind of stitch composed of one thread, so tied or knotted in the material by suitable instruments as to entirely prevent it from unravelling, should it break at any part of the seam. 2. To the application of a break or other suitable mechanical contrivance to sewing machines, whereby the possibility of such machines being raised or turned the wrong way is obviated. 3. To the production of a three-thread stitch by interlooping the three threads together by suitable instruments.

Worrall, James, junior, of Salford, Lancaster, dyer and finisher. *Certain improvements in the method of bleaching fustians and other textile fabrics, and in the machinery or apparatus connected therewith.* Patent dated April 6, 1854. (No. 801.)

The inventor proposes "to draw the cloth through the liquid in an even and uniform manner, or to obtain a similar effect by pouring, raining, or showering the boiling

alkaline liquor over or against, or through the cloth."

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *A revolving, blowing, and ventilating water-extractor for drying cloth.* (A communication.) Patent dated April 6, 1854. (No. 802.).

This invention consists mainly in the use of a revolving basket, fitted with fans or wings on the outside periphery, and placed inside a tub provided with a spout, "the centrifugal motion of the basket and fans producing a current of air through the materials to be operated upon, and preventing thereby the necessity of the great speed required to extract the water by centrifugal force alone."

Tylor, Alfred, of Warwick-lane, London. *Improvements in moderator-lamps.* (A communication.) Patent dated April 7, 1854. (No. 805.)

By placing the swivel in the centre of the plunger the inventor is enabled to fix the rack in the centre of the swivel, and thus obtain a central pull on the plunger instead of upon the side, as heretofore, and also to obtain a more direct passage of oil to the burner, by fixing the supply-tube at one side of the centre of the swivel, instead of in the centre of the plunger.

Glover, Frederick Robert Augustus, of Bury-street, Westminster, master of arts. *Improvements in two-wheeled carriages.* Patent dated April 7, 1854. (No. 807.)

These improvements consist mainly in constructing carriages with compound shafts in such manner that they shall also act as springs for supporting the load to be carried. They are formed of two parts, attached together near to one end, and apart from each other at the other end.

Jopling, Jonathan, of Bishopwearmouth, Durham, smith and iron-founder. *Improvements in preserving the tuyere used for blowing in forge and other furnaces from the action of the fire.* Patent dated April 7, 1854. (No. 811.)

A full description of this invention was given on page 363 of the current volume.

Bentley, William Henry, of Bedford, engineer. *Improvements in irrigators or machines for watering grass and other lands, roads, floors, flowers, plants, shrubs, and trees, and applicable for all purposes for which ordinary watering-pots are employed, parts of which improvements are also applicable to pumps for raising and forcing liquids.* Patent dated April 7, 1854. (No. 812.)

The main feature of this invention consists in adapting a plunger to the spout of the irrigator, so that it may act as a pump, and in making the plunger tubular, so that the water may be forced through it as it is worked up and down in the spout, by which means a jet may be thrown to a great distance, in any required direction.

Wood, Thomas, of Rumford-street, Oxford-street, Manchester, engineer. *Improvements in centrifugal machines.* Patent dated April 7, 1854. (No. 813.)

*Claims.*—1. The employment of wedges for the purpose of varying the centre of gravity of the cylinders of centrifugal machines, and also for altering and fixing the position of the cylinder in relation to the shaft, for the purpose of balancing the same. 2. The employment of liquids introduced, at the discretion of the workman, into distinct chambers on the cylinders of centrifugal machines, for the purpose of balancing the same.

Rankin, John, of Liverpool, Lancaster. *Improvements in machinery for cleaning corn and seed.* Patent dated April 7, 1854. (No. 814.)

This invention consists of improvements in machinery for which a patent was granted some years ago, consisting of a cylinder, within which a peculiar form of beater and fan are made to revolve, for the purpose of agitating the corn and seed and subjecting them to currents of air, which pass in the opposite direction. The improvements "consist in surrounding one part of the cylinder with an outer casing, and making such portion of the cylinder reticulated, and any smaller seed or other matters which pass into such surrounding casing are kept separate, and conducted by a suitable channel or spout to a separate receiver, and streams of air are caused to act on the corn or seed as the same leaves the machine."

Condy, Henry Bollman, of Battersea, Surrey. *Improvements in concentrating beer, ale, cyder, wine, and vinegar.* Patent dated April 7, 1854. (No. 815.)

*Claim.*—Concentrating the articles enumerated in the title by freezing, distilling, or crystallizing matters therein.

Johnson, John Robert, of Stanbrook-cottage, Hammersmith, Middlesex. *Improvements in the manufacture of type and other raised surfaces for printing.* Patent dated April 7, 1854. (No. 817.)

The object of this invention is to obtain harder and more durable type and raised surfaces for printing, by employing in their manufacture tin in large proportions, with antimony, and by greatly reducing or wholly omitting the use of lead.

Johnson, John Henry, of Lincoln's-in-fields, Middlesex, gentleman. *An alkaline steam-washing apparatus.* (A communication.) Patent dated April 7, 1854. (No. 818.)

The inventor constructs a rotatory cylinder in such manner that a current of steam can be generated or let into the bot-

tom of it, under the suds and clothes to be washed, and allowed to escape at the top.

Rigby, William, of Manchester, Lancaster, engraver. *Certain improvements in machinery or apparatus for engraving metallic cylinders or rollers, employed for printing calico and other surfaces.* Patent dated April 7, 1854. (No. 819.)

This invention relates to an improved method of producing any figure or repetitions of a figure upon the surface of a cylinder "through a combination of two motions, one in the direction of rotation, which I recommend," says the inventor, "being given to the cylinder, and one in the direction of its length, which I recommend being given to the tool or tools;" and the invention consists in a peculiar arrangement of apparatus, by means of which both these motions are simultaneously effected on the passing of a tracer over an enlarged drawing of the figure, the tracer being affixed to a carriage, which travels upon a bar or rail, connected with the cylinder by arms attached thereto in such way as to impart to it its rotatory motion. This carriage, by travelling along the said rail, also transmits a longitudinal motion to the tool or tools through gearing attached to the rail between the carriage and the tools.

Naylor, William, of Norwich, engineer. *Improvements in locomotive engines.* Patent dated April 7, 1854. (No. 820.)

This invention relates to the heating of the feed-water in locomotive engines, and consists of admitting the water into a heating vessel, in which is fitted a perforated pipe, through which a supply of steam is admitted. Should the steam thrown into the heater be much in excess of what is required, it is carried off by a pipe situated a little below the hand-rail of the engine foot plate.

Naylor, William, of Norwich, engineer. *Improvements in power hammers.* Patent dated April 7, 1854. (No. 821.)

These improvements relate to the working of power hammers by means of a vacuum combined with the use of steam, or by means of a vacuum only.

Newton, William Edward, of Chancery-lane, Middlesex, civil engineer. *Improvements in producing stereoscopic pictures, and in the apparatus for exhibiting such or similar pictures.* (A communication.) Patent dated April 7, 1854. (No. 822.)

*Claim.*—Giving to the pictures of stereoscopic or other instruments of an analogous character a panoramic motion into and out of the field of vision.

Whitehead, Thomas, of the firm of Taylor, Wordsworth, and Co., of Leeds, York, machine and tool-makers. *Improvements in machinery for preparing, combing, drawing, and spinning wool, flax, cotton, silk, and other fibrous substances.* Patent dated April 7, 1854. (No. 823.)

This invention relates mainly to the application to drawing, preparing, and combing-machinery of a novel construction of comb to be used in lieu of the ordinary gill pins. These combs are formed from plates of metal, horn, or bone, having teeth cut on one edge in the ordinary manner, and are attached to gill bars or fallers, or to rollers, so as to form porcupine rollers, or are otherwise suitably applied.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements applicable to the manufacture of weavers' harness.* (A communication.) Patent dated April 8, 1854. (No. 825.)

This invention consists in applying machinery to the manufacture of weavers' double-knotted leash harness. The objects effected by the machine described are the following, viz.:—"Tying two knots which form the eye in the middle of the harness: tying a knot upon each back band, to confine the eye to its place: forming a leash between the eye and one of the back bands, and removing or drawing away the back bands as the twine is tied to them, in order to regulate the number of the beers to the given space."

Bromley, Thomas, of Liverpool, Lancaster, soap-boiler. *Improvements in the manufacture of soap.* Patent dated April 8, 1854. (No. 826.)

*Claims.*—1. "The extraction from the extracts of sheep, lambs, or other animals, oil or fat, a primitive element for the manufacture of soap. 2. The deodorising of such extracts for the purpose of obtaining such oil or fat free from unpleasant odour or smell. 3. A mode by which the same is mixed with the caustic soda or alkali. 4. The bleaching of such oils by a described process."

Platt, John, of Oldham, Lancaster, machine maker. *Certain improvements in machinery for preparing cotton.* Patent dated April 8, 1854. (No. 827.)

*Claim.*—"The application and use of double centrifugal presser flyers."

Worby, William, of Ipswich, Suffolk, *Improvements in machinery or apparatus for separating grain from straws, broken off ears, husks, and other refuse, after being thrashed.* Patent dated April 8, 1854. (No. 829.)

This invention consists in arranging a sieve or wire-work trough, fitted with a rotating axis and stirrer, in a suitable frame. The axis has fixed on it numerous projections arranged spirally around it in such manner that, in addition to raking or stirring the grain, they throw out such of it as does not pass through the sieve.

WILLIAMS, WILLIAM, of Park-cottage, Ebbw-vale, and THOMAS EVAN WILLIAMS, of Abersychan Ironworks, near Pontypool, Monmouth. *Improvements in reverberatory furnaces.* Patent dated April 8, 1854. (No. 830.)

The object of this invention is to arrange several reverberatory furnaces together, so that one fire may heat either or all of them. The inventor supposes the most convenient arrangement to be as follows:—the fireplace or furnace is made with three bridges, one at each of three of its sides, and a reverberatory furnace is constructed to each bridge; the flues are arranged to exclude cold air from the body of either of the furnaces, and heated air is introduced to insure combustion.

GILBEE, HENRY, of South-street, London. *Improvements in the construction of axle-boxes and axle-bearings.* (A communication.) Patent dated April 8, 1854. (No. 834.)

This invention consists—1. In employing anti-friction rollers, revolving freely on axes, in the construction of the axle-bearings and boxes of revolving shafts. And 2. In mechanical arrangements for lubricating these anti-friction rollers and the journals of the shafts.

TROUBLE, LOUIS MARIE, of Paris, France. *Certain improvements in stamping apparatus (or autoperitype).* Patent dated April 10, 1854. (No. 835.)

The "autoperitype" is a stamping apparatus consisting of a cylindrical surface, upon which are engraved or affixed one or more stamps, from which impressions may be obtained by causing the cylindrical surface to roll continuously, or with interruptions, on the surface to be stamped.

WOOD, WILLIAM, of Monkhill-house, Pontefract, York. *Improvements in treating animal matters and refuse.* Patent dated April 10, 1854. (No. 836.)

*Claim.*—Boiling, drying, or otherwise treating animal matters and refuse by heat in closed vessels, in which a vacuum or partial vacuum is formed by withdrawing therefrom the air and the vapours and gases generated, by means of a pump or other exhauster, and forcing them into and amongst water or other suitable mixture for condensation and absorption.

WOOD, WILLIAM, of Monkhill-house, Pontefract, York. *Improvements in apparatus employed in the manufacture of cut pile fabrics.* Patent dated April 10, 1854. (No. 837.)

These improvements "consist in forming the cutting edge at an acute angle (or approximating thereto) to the wire."

BOLTON, ALFRED SOHIER, of Birmingham, Warwick, manufacturer, and FRANCIS SEDDON BOLTON, of Birmingham, manufacturer. *An improvement or improvements in the construction of steam boilers.* Patent dated April 10, 1854. (No. 838.)

This improvement consists in the use of twisted metallic tubes in the construction of steam boilers, for the purpose of obtaining a greater than usual transfer of heat from the gases of combustion to the water in the boiler.

BOLTON, ALFRED SOHIER, of Birmingham, Warwick, manufacturer, and FRANCIS SEDDON BOLTON, of Birmingham, manufacturer. *A new or improved method of manufacturing certain kinds of metallic tubes* Patent dated April 10, 1854. (No. 839.)

This invention consists in manufacturing twisted metallic tubes by passing untwisted tubes through a properly formed draw-plate or burr, to which a rotatory motion is communicated by the motion of the chain or drum of the draw bench.

BAUWENS, FELIX LIEVEN, of Pimlico, Middlesex, chemist. *Improvements in distilling fatty bodies, and in stills or apparatus for such distillation.* Patent dated April 10, 1854. (No. 840.)

This invention consists—1. In forcing air or other suitable gas into the still, together with steam, by means of an air-pump or other forcing apparatus. And 2. In constructing a certain described continuous still or apparatus.

BAKER, WILLIAM LEWIS, of Hargreave, Northampton, civil engineer. *Improvements in clock-tower, turret, and other like bells.* Patent dated April 10, 1854. (No. 841.)

*Claims.*—1. The hanging of clock-tower, turret, and other like bells, upon one bolt or axis. 2. The construction of the stock or beam of such bells of metal. 3. The construction of such bells with a wheel attached to them, or ring of teeth cast thereon, having an endless screw or pinion gearing therewith, for the purpose of enabling the bells to be turned round, so as to present a fresh surface to the clapper or hammer.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in the manufacture of hats.* (A communication.) Patent dated April 11, 1854. (No. 842.)

*Claim.*—A mode of forming felt-cloth hats, so that they will afterwards maintain their shape and stiffness under all circumstances of ordinary wear, by introducing gutta percha, either pure or in some of its combinations, between two sheets of felt-cloth, and afterwards forming the said sheets into a hat by pressure in a mould, while the gutta percha is in a plastic state.

ROUND, ZACHARIAH, of Dudley, Worcester, plasterer. *An improvement or im-*

*provements in bricks to be used in certain parts of buildings.* Patent dated April 11, 1854. (No. 843.)

This improvement consists in "the introduction or attachment of pieces of wood or metal, or both, into or on bricks, for the purpose of affording a convenient means of attaching to the walls into which the said bricks are built, such objects or matters as may require to be attached thereto."

LAVENDER, EDWARD, of Prince's-road, Bermondsey. *Improvements in apparatus for stirring and acting on matters subjected to heat in retorts.* Patent dated April 11, 1854. (No. 845.)

The inventor places within the retort (which is capable of revolving) a shaft or axis, having upon it a series of blades or suitable arms so arranged that they may be placed from time to time at different angles with the shaft or axis, so that the matters in the retort may at times be simply stirred, at other times moved to and fro in the retort, and at other times moved towards one end of the retort and discharged from it.

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CRAIG, WILLIAM G., of Newport, Monmouthshire, engineer. *An improved mode of making communications between the commander and the engineer, or the helmsman, or other person on ship-board.* Application dated April 6, 1854. (No. 790.)

This invention consists of an arrangement of levers which actuate index pointers or hands attached to dials, having certain signals printed or otherwise marked upon them.

BOYD, JAMES EDWARD, of Lewisham, Kent, gentleman. *Improvements in the construction of ships' anchors.* Application dated April 6, 1854. (No. 795.)

In carrying out this invention, electric, magnetic, galvanic, mechanical, or other agency, "to be conveyed by means of the ship's cable, chains, ropes, wires, or otherwise," is to be employed in such manner that certain parts of the anchor may be "disunited or disjointed, or set in action at the will of the operator, counteracting its holding property, and thereby setting the ship free from the restraint of the anchor."

YULE, JOHN, of Port Dundas-road, Glasgow. *Improvements in the machinery for raising minerals from mines.* Application dated April 6, 1854. (No. 797.)

The improved machinery consists of one pit-head pulley, one rope, and two cages. "I place the pulley," says the inventor, "immediately above the mid wall of the pit, and the axle is in line with the mid wall, so that ropes hung from the circumference of the pulley on opposite sides will plum the centre of a cage. On the pulley being set in motion, with a rope upon it, while one end is going up the other will be going down, and *vice versâ,* forming a complete winding apparatus without wheels, points, or point-shafts, and with only one rope."

CHANES, JOSEF, of Davies-street, Berkeley-square. *An improvement in the manufacture of ribs of umbrellas and parasols, and of busks and substitutes for bones of stays and dresses.* Application dated April 6, 1854. (No. 798.)

This invention consists in applying horn to the manufacture of the articles named in the title.

RICHARDS, WILLIAM, of Barcelona, Spain, Engineer to the Gas-works. *Improvements in wet gas meters.* Application dated April 6, 1854. (No. 803.)

This invention "consists in the employment of a partially spheroidal vessel in the measuring chamber in combination with a universal joint-valve motion and plumb-valve."

WILLIAMS, THOMAS, of Manchester, Lancaster, storekeeper, SAMUEL AINLEY, mechanic, and MOSES MILLS, agent, both of Oldham, in the same county. *Improvements in machinery or apparatus for spinning cotton, wool, flax, or other fibrous materials.* Application dated April 7, 1854. (No. 804.)

This invention mainly consists in constructing mechanism for regulating the strap fork which moves the strap on the conical drums of the self-acting mule.

MOSS, HENRY, of Mansfield-street, Cavendish-square, Middlesex, gentleman. *An auriferous quartz washing, pulverizing, crushing, separating, and amalgamating machine.* Application dated April 7, 1854. (No. 806.)

This machine consists of a crusher driven by steam or water power in a stationary pan, "the crusher having a revolving, oscillating, twisting, and wabbling motion," imparted to it from an upright shaft, an eccentric crank, and a universal joint.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Certain improvements in the preparation of photographic paper.* (A communication.) Application dated April 7, 1854. (No. 808.)

This invention consists—1. Of apparatus composed of pans with edges perfectly flush, resting on a plate of glass, so as to allow the liquid chemical solution which is spread on the surface of the paper to combine with it in the absence of any intervening atmospheric light, dust, &c.; and, 2. Of a frame with a sliding door, which perfectly incloses the moistened paper, so as to preserve it from the effects of light.

SAUGRIN, LOUIS FRANCOIS, of Paris, France, photographist. *Improvements in the*

*construction of stereoscopes.* Application dated April 7, 1854. (No. 809.)

The inventor constructs portable stereoscopes with moveable lenses and certain collapsible springs.

HARLING, ROBERT, of Clerkenwell, mechanist. *Certain mechanical arrangements for multiplying power.* Application dated April 7, 1854. (No. 810.)

The inventor proposes to increase the motive power in all crank and fly-wheel machinery by the intervention of screws.

WILSON, JAMES EDWARDS, of Great George-street, Westminster, civil engineer. *Improvements in the construction of iron girders.* Application dated April 7, 1854. (No. 816.)

In carrying out this invention wires, rods, bars, or tubes of wrought-iron, combined in any way, are introduced into moulds of the requisite form, and cast-iron is then run into the moulds, filling up the spaces not occupied by the wrought-iron.

CORLETT, JOHN, of Luimbres, France, engineer. *Improved machinery for preparing or scutching flax and other fibrous materials requiring such an operation.* (A communication.) Application dated April 7, 1854. (No. 824.)

The main object of this invention is to prepare flax, by the better breaking of the straw, for the after process of removing the woody parts.

CLOUGH, CHARLES BUTLER, of Tyddyn Mold, Flint. *Improvements in the manufacture of coffins.* Application dated April 8, 1854. (No. 831.)

The inventor proposes to make coffin lids and bottoms, each in two parts, which are to be cut out of a parallel plank, in forms corresponding to those of the top and butt planks sometimes worked on ships' bottoms.

MOAT, WILLIAM CROFTON, of the Strand, Westminster, surgeon. *A machine for crushing, pulverizing, and amalgamating.* Application dated April 8, 1854. (No. 832.)

This machine consists of a drum or cylinder furnished with flanges, upon the inner surface of which cylinder is placed a conical or plain roller; rotary motion is to be imparted to the roller in one direction, and to the drum in the opposite, the latter being supported by and revolving upon two or more rollers placed so as to sustain it.

SAVAGE, GEORGE, of Stoke Bruen, Northampton, brick and tile maker. *Improvements in the manufacture of bricks and roofing tiles.* Application dated April 8, 1854. (No. 833.)

This invention consists in an improved mode of indurating bricks, to render them impervious to moisture, by the use of a mixture composed of 2 parts of the resin of commerce, 2 of pitch, 2 of size, 2 of resin oil, 2 of common oil, and 30 of gas tar; the whole being well mixed together and boiled, and the bricks then immersed in it.

BROOKS, WILLIAM ELLIOTT, of Queen-street, Middlesex, frame maker. *Improvements in valves for atmospheric railway tubes.* Application dated April 11, 1854. (No. 844.)

This invention consists in applying to the longitudinal valve of atmospheric tubes, one or two tubes of vulcanized India rubber or other suitable elastic material, containing air, water, or other fluid.

## PROVISIONAL PROTECTIONS.

*Dated September* 12, 1854.

1984. Richard Laming, of Carlton Villas, Maida Vale, Middlesex. Improvements in purifying gas from ammonia and other impurities, and preparing pure gas for burning, in obtaining ammonia and certain salts of ammonia and soda, and in treating certain salts of ammonia.

*Dated September* 20, 1854.

2024. Alfred Tylor, of Warwick-lane, Newgate-street, London, and Henry George Frasi, of Herbert-street, New North-road, Middlesex. Improvements in water-closets.

*Dated October* 4, 1854.

2128. Frederick Samson Thomas, of Cornhill, London, and Hook's Villa, Fulham, Middlesex, gentleman. Improvements in locomotives.

2130. David Chalmers, Manchester, Lancaster, machinist. Improvements in the mode or method of working railway breaks, and communicating signals.

2132. John Disher, of Edinburgh, Scotland, brewer. Improvements in mashing-apparatus for brewing.

2134. Thomas Crossley, of Scott's-yard, Bush-lane, London, gentleman. An improved mode of manufacturing printing-blocks. A communication.

2136. William Henry Phillips, of Camberwell New-road, Surrey, engineer. Improvements in rotatory steam engines.

2138. John Perry, of Hunslet Old Mill, near Leeds, York, wool-comb maker. Improvements in preparing wool for combing.

*Dated October* 5, 1854.

2140. William Bridges Adams, of Adam-street, Adelphi, Middlesex, civil engineer. Improvements in rails for railways, and in the connections and fastenings for rails.

2142. Thomas Harris, of Nantyglo, Aberystruth, Monmouth, engineer. Separating the steam from the condensed water and mud in its transit from the boiler to the cylinder of a steam engine, stationary or locomotive.

2144. William Frost, of Wine-office-court, Fleet-street, London, engineer. Improvements in steam engines.

2146. John Adams Lander, of the Southwark-bridge-road, civil engineer. Improvements in machines employed in and for the manufacture of spikes and nails.

2148. François Durand, of Paris, France, mechanician. Certain improvements in circular looms.

*Dated October 6, 1854.*

2150. John Brittoo, of Birmingham, Warwick, engineer. A new or improved machine for sweeping or cleaning chimnies.

*Dated October 7, 1854.*

2152. William Chambers, of Hampson Mill, near Bury, Lancaster, bleacher. Improvements in machinery for beetling cotton and other fabrics.

2154. Robert Way Uren, of Fegginton, Devon, engineer. Improvements in machinery for the manufacture of bricks and tiles.

2156. Jean Baptiste Séraphin de Méritens, gentleman, of Paris, France. Certain improvements in the mode of dyeing cotton, flax, and other fibrous substances, and fabrics generally.

2158. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in windlasses. A communication.

*Dated October 9, 1854.*

2160. James Aikman, of the firm of James and George Aikman, of Paisley, Renfrew, finishers. A roller for scouring and finishing textile fabrics.

*Dated October 10, 1854.*

2162. William Cresshill, of Beverley, York, civil engineer. Improvements in the construction of portable railways.

2164 Henry Thomas White, of Queen's-terrace, Hammersmith, army accoutrement-maker, and George Roberts, of Great Peter-street, Westminster, miner. An improved mode of rendering hats, caps, and other coverings for the head self-ventilating.

2170. Henry Crosley, of Camberwell-grove, Surrey, civil engineer. Improvements in the manufacture of waddings for cannons and fire-arms.

2172. Marie Amédée Charles Mellier, of Paris. Improvements in the manufacture of paper.

*Dated October 11, 1854.*

2176. Samuel Rogerson and James Rogerson, of Manchester, Lancaster, trimming-manufacturers. Improvements in the production of ornamental patterns upon velvet and other woven fabrics, and in machinery or apparatus for effecting the same.

2178. John Jackson, of Belfast. Improvements in treating or preparing tow, so as to render it fit for drawing or roving.

*Dated October 12, 1854.*

2180. Edward John Seville, of Brixton, Surrey, gentleman. An improvement in the manufacture of hats. A communication.

2182. James Timmins Chance, of Birmingham, Warwick. Improvements in manufacturing articles from the minerals or rocks of the descriptions commonly called basalt or trap, sometimes Rowley-rag and Whinstone.

2184 Joseph Hood, of Newmilns, Ayr, machinist. Improvements in ornamental weaving.

2186. François Alexandre Nicolas Delsarte, professor, of Rue Croix Boissière, Paris, France. A new mode of and apparatus for tuning pianos and other kind of stringed instruments.

*Dated October 13, 1854.*

2188. James Lamb Hancock, of Milford Haven, Pembrokeshire. An improved machine for ploughing or working land.

2190. Arthur Dobson, of Belfast, Antrim, Ireland, bleacher. Certain improvements in looms for weaving.

2192. George Weeks, of Dorset-street, Portman-square, Middlesex, and George Planer, of Globe-road, Mile-end, Middlesex. Improvements in the construction of furnaces.

*Dated October 16, 1854.*

2198. Soren Hjorth, of Copenhagen. An improved magneto-electric battery.

2200. Christopher Holt, of the New-road, St. Pancras, Middlesex. Improvements in fastenings for the laths of iron bedsteads, couches, and other similar articles of furniture.

2204. James Hadden Young, of College-street, Camden-town, Middlesex. Improvements in brooms or brushing apparatus.

2206 William John Bleasker, of Birmingham, Warwick, manufacturer. A new and improved and durable method of labelling bottles, and such like vessels or articles as require or may require labelling.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," October 31st, 1854.*)

1284. George Henry Byerley. Improvements in machinery for the manufacture of bricks, tiles, quarries, tubes, and other such like articles.

1351 William Donald and William Higginbotham. Certain improvements in looms.

1352. Thomas Rhoads. An improved method of framing school-slates. A communication.

1380 Charles Phillips. The improvement of apparatus or machinery for reaping.

1385. Auguste Edouard Loradoux Bellford. Certain improvements in machinery for picking or opening cotton and other fibrous materials, and all kinds of waste rags and old materials to prepare the same for the operation of carding or for other operations. A communication.

1400. John Kenworthy. Certain improvements in water-closets.

1405. Henri Mantegnde. Improvements in the manufacture of boots, shoes, galoches, or in shoe-making generally.

1425. Edmund Cockshutt. Improvements in bungs or adjustable stopper apparatus for casks and other vessels.

1431. Edward Joseph Hughes. Improvements in sewing-machines. A communication.

1435. Louisa Monzani, widow and administratrix of Willoughby Theobald Monzani. Improvements in the manufacture of folding-chairs, stools, and other articles to sit or recline upon.

1443 Thomas Richards Harding Improvements in the manufacture of the pins of heckles, combs, and cylinders used in heckling, combing, and preparing wool, flax, and other fibrous substances, and in the mode of applying them to manufacturing purposes.

1450. Christopher Thomas Tiffany. An improvement in the manufacture of brushes used in gig mills and machinery for brushing piled fabrics.

1491 William Pole Certain improvements in the construction of railways.

1540. John Baptist Chauvet fils. A new system of anchor.

1582. George Wade Kelsey. Improvements in air engines.

1616. William Septimus Losh. Improvements in bleaching.

1647 William Littell Tizard. Improvements in fermentation and in apparatus employed therein.

1892 John Seithen Improvements in the manufacture of cases or envelopes for covering bottles.

1962. Robert Christopher Witty. Improvements in illumination by means of artificial light.

2000. Samuel Collins. A new or improved castor for furniture.

2004. Alfred Tyler and Henry George Frost. Improvements in water-closets.

2035. Auguste Edouard Loradoux Bellford. Cer

tain improvements in sewing-machines. A communication.

2095. John Nelson Gamewell. Improvements in instruments for relieving the wires of the electric telegraph of atmospheric electricity.

2124. Christopher Nickels and James Hobson. Improvements in apparatus used when weaving piled fabrics by the aid of wires.

2140. William Bridges Adams. Improvements in rails for railways, and in the connections and fastenings for rails.

2164. Henry Thomas White and George Roberts. An improved mode of rendering hats, caps, and other coverings for the head self-ventilating.

2173. Pierre Etienne Proust. A new system of apparatus for greasing or lubricating axles and other rotating portions of carriages, and of machinery.

2174. Jean François Jules Alexandre Boulet, Improvements in the manufacture of steel.

2182. James Timmins Chance. Improvements in manufacturing articles from the minerals or rocks of the descriptions commonly called Basalt or Trap, sometimes Rowley-rag and Whinstone.

2204. James Hadden Young. Improvements in brooms or brushing apparatus.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed October* 27, 1854.

953. Thomas Griffith Owen.
958. Henry Clarke.
965. James Heywood.
966. Alexander Mills Dix.
967. Benjamin Dixon.
1036. Charles Liddell.
1110. John Henry Johnson.
1172. Joseph Albert Corwin.
1194. Auguste Edouard Loradoux Bellford.
1447. John Wilder.
1484. John Lamb.
1566. Thomas Mayos Woodyatt.

*Sealed October* 31, 1854.

973. William Augustus Archbald.
979. Thomas Jackson.
980. William Hutton.
981. Jos. Mayer and John David Kind.
983. Richard Waller.
990. Benjamin Bishop and Joseph Dyer.
995. Eugene Hippolyte Rascol.
1000. Charles Barlow.
1007. Adrien Georges Amant Martin and Casimer Lefol.
1010. Arthur Warner.
1019. Richard Waller.
1027. Henry Moore Naylor.
1030. George Thomas.
1039. William Coles Fuller.
1041. James Ward Hoby and John Milner.
1045. John Lawson.
1057. William Waite.
1081. Richard Archibald Brooman.
1147. Louis Emile Dufour.
1185. Henry Kraut.
1205. George Alfred De Penning.
1215. Charles King and Edward Sutton Benfield.
1240. Antoine Chavanes.
1269. Bewicke Blackburn.
1288. John Young.
1319. Peter Armand Lecomte de Fontainemoreau.
1349. Robert Reeves.
1353. William Edward Newton.
1358. Henry Dembinski.
1365. John Fry Heather.
1388. Auguste Edouard Loradoux Bellford.
1401. Reuben Bottomley, David Schofield, and Henry Spencer.
1418. William Coltman.
1473. Joseph Burch.
1585. Jonas Whiteley, John Slater, and William Henry Crossley.
1611. Charles Harratt.
1625. Auguste Edouard Loradoux Bellford.
1661. Alexander Law.
1687. Alfred Vincent Newton.
1705. William Rye and Wm. Crowther.
1807. John Pretty Clarke.
1809. William Edward Newton.
1811. John Coney.
1826. James Hodgson.
1827. James Allen.
1845. William Hunter Meriwether.
1847. William Edward Newton.
1855. Peter Fairbairn and Thomas Greenwood.
1862. Peter Armand Lecomte de Fontainemoreau.
1865. Joseph Henry Tuck.
1873. William Smith and Thos. Phillips.
1877. Peter Fairbairn and Rt. Dempster.
1884. John Gray.
1887. Joseph Burridge.
1923. Richard Dugdale Kay.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

The communications of *J. M.* (Temple), *Dr. Kemp*, *G. B.* (Hoxton), *Dejere* (reply to Alma), and *Justitia*, are unavoidably delayed.

*J. G.*—You will find all you require in the little work noticed in a former page of this number, and edited by Mr. Tomlinson.

*V. R.*—We shall publish a notice (perhaps a review) of the work recently forwarded at our earliest convenience. A little necessary delay in noticing a work on such a subject, cannot be of great importance. It is but one of many books received, for reviews of which we cannot at present find space.

## LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| Oct. 10 | 3646 | Joseph Relfe | Whitechapel | Gum-vase. |
| 13 | 3647 | W. Bradshaw and J. Sanson | Nottingham | Stench-trap. |
| 21 | 3648 | T. Wharton and Sons | Birmingham | Label-box. |
| 24 | 3649 | E. Conlan | Bloxwich | Bit. |
| 25 | 3650 | Burgess and Son | Birmingham | Pencil-case. |
| 26 | 3651 | J. Gregory | East India-road | Seating for valves. |
| 27 | 3652 | S. Plummer | Upper Holloway | Meat-hook. |
| 31 | 3653 | Dent, Allcroft, and Co. | Wood-street | Devonshire collar. |
| Nov. 1 | 3654 | Parrott and Pickin | Birmingham | Railway-lamp. |

## LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| Oct. 9 | 608 | E. Mudd and A. Perkins | Dartford | Camp-seat. |
| " | 609 | C. O. Robsin | King's-cross | Chimney-pots. |
| 10 | 610 | W. S. Mappin | Birmingham | Torniquets. |
| 12 | 611 | J. S. Cockings | Birmingham | Whip-socket. |
| 13 | 612 | B. Haywood | Dublin | Label-attacher. |
| 17 | 613 | T. Piatti | Paris | Compass. |
| 25 | 614 | Hare and Co. | Essex-street | Knife-holder. |
| " | 615 | T. Hinton | Lyme | Bullet. |
| 27 | 616 | T. Dyke | Darlington | Clipping-machine. |
| " | 617 | Holden and Nicholas | Birmingham | Shot-charger. |

## CONTENTS OF THIS NUMBER.



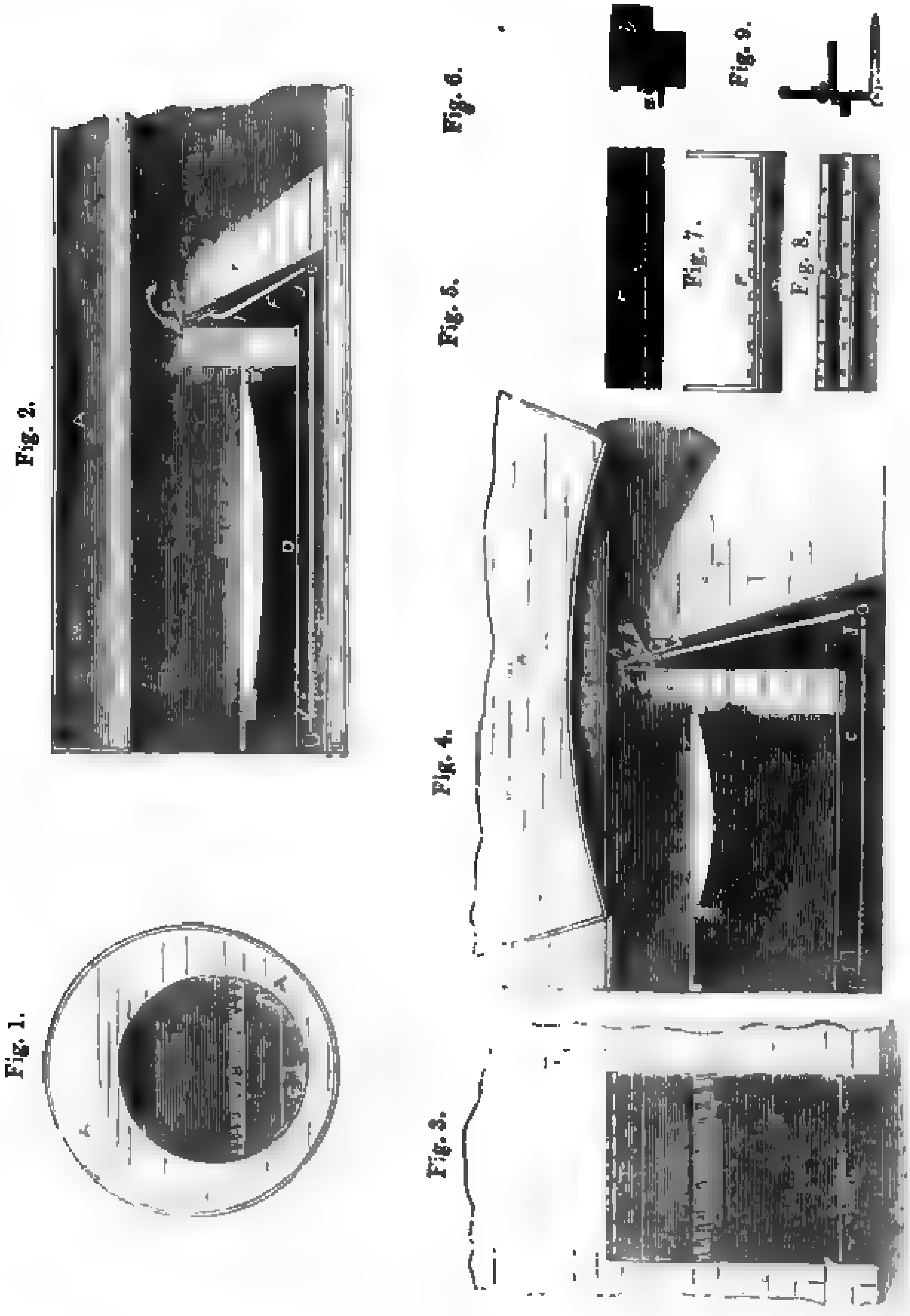
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No 1631.] SATURDAY, NOVEMBER 11, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## GALLOWAY'S PATENT IMPROVEMENTS IN FURNACES.



## GALLOWAY'S PATENT IMPROVEMENTS IN FURNACES.

(Patent dated April 22, 1854.)

Mr. Galloway, of Lambeth, whose improvements in tubular boilers we recently described, has since patented a method of admitting air to furnaces by a pipe or pipes under the furnace bars, into the bridge, and through the top of the bridge into the fire, by a moveable metal mouthpiece or valve.

Fig. 1 of the engravings on the preceding page is a sectional elevation, and fig. 2 a longitudinal section of a Cornish boiler, having a furnace constructed according to the invention. A is the boiler, and B the firegrate. C is the air tube, which is formed by placing a plate of iron, D, a few inches above the bottom of the ashpit, and extending the whole length and breadth of it. This plate is air tight at the sides and bridge end, and forms the bottom of the ashpit, on which the ashes, &c., fall from the firegrate. E E′ is the bridge, which is made hollow, as shown in fig. 2, the front part, E, or that which is nearest the fire, being built perpendicular, and the back part, E′, at an angle, leaving a hollow space, F, between them, which forms a continuation of the air tube, C, and is of sufficient dimensions to admit of the movement of the parts by which the mouthpiece or valve is worked, as hereinafter mentioned. G is the mouthpiece or valve, which is of an angular form, and is supported on two or more hooks, H, built into the brickwork of the back part, E′, of the bridge. I is a lever, fixed to the mouthpiece, G, and J is a rod, with a handle, under the control of the engineman, connected to the lever, I, and by means of which the mouthpiece or valve, G, can be brought to any desired position, so as to close wholly or partially the outlet from the hollow of the bridge, as may be required. The rod, J, is formed with a rack near its outer end, to enable it to be held by the catch, K, in any position to which it may have been moved. The arrangement described is also applicable to other forms of boilers, where the contraction of the space over the firebridge is not considered; but in cases where sufficient room is required for a man to pass over the bridge, the inventor forms a portion of the front of the bridge of metal, and attaches it to the fixed part of the bridge, so that it may be readily removable; the valve then works against the top edge of this metal part, instead of against the corner of the firelamp at the top of the bridge.

Fig. 3 is a sectional elevation, and fig. 4 a longitudinal section of a still, copper, or boiler, having a furnace constructed according to this arrangement. Figs. 5, 6, and 7 are respectively a front elevation, a cross section, and a plan of the mouthpiece, which is fitted to the front of the bridge, detached; and figs. 8 and 9 are a back elevation and a cross section of the valve, detached. A is the copper, still, or boiler, and B the firegrate. C is the air-tube, and E E′ the bridge, as before described. F is the mouthpiece, which is fitted to the front part of the bridge, E, and supported in position by the projecting piece, *a a*, and the end pieces, *b b*, which latter come against the sides of the furnace. G is the valve, which is supported by the hooks, H, built into the brickwork of the back part of the bridge, E′, and is worked by the rod and lever, J I, as in the arrangement before described. The lever, I, is secured to the valve by bolts, *c*, and a flap, *d*, is fixed to the back of the valve, to prevent ashes, &c., from choking it. By removing the mouthpiece, F, and unscrewing the bolts, *c*, so as to free the valve, and then lifting out the valve, ample space will be given above the firebridge.

In the arrangements described, the air admitted to the furnace through the tube, C, is entirely independent of that passing to the fire through the ashpit; and hence the power of the chimney draught will not be diminished, whatever may be the position of the valve, G. The air admitted through the hollow bridge is also to be heated in its passage by impinging against the front part, E, of the bridge, which is exposed to the full heat of the fire. The advantage of the valve at the top of the bridge is, that it controls the force and quantity of the air admitted by it. In no two furnaces will the draught be the same; when the draught is very sharp, the valve requires to be only slightly open; for if open too much, the quantity of air passing cools the brickwork below the required temperature, and it will not then combine with the combustible gases. When the draught is slow, the valve requires to be opened a greater distance to obtain the proper quantity of air, which then passes in with less speed, and does not cool the brickwork so quickly; in either case the valve is not required to be open longer than two or three minutes to bring the furnace to the proper condition.

# PATENT CASES IN EQUITY.

NO. II.

## ORIGINAL INVENTION OF GREASE-TIGHT RAILWAY AXLE-BOXES.

(*Continued from page 440.*)

The patent of Vigurs, dated Nov. 4, 1851, will be understood from the following description, which contains the substance of that part of his specification which relates to grease-tight axle-boxes:

The axle-box, the body of which may be externally similar in form and dimensions to those in ordinary use, has a top covering plate with an opening through which the grease is supplied, and which is fitted with a hinged lid or cover. The lower female member of the hinge is not cast with the covering plate, but is made separately, and inserted into a recess left for its reception in the casting, and screwed into its place by a screw. A back spring serves to keep the lid in position, whether open or close. The box is furnished with a channel, down which the grease flows to the journal or bearing brass, which is slid into a dovetail groove cast into the axle-box, from the front of the latter. There are a number of vertical slots or openings through the bearing brass, for the passage of grease to the axle. These openings or passages the inventor fills with sponge, tow, cotton, or other similar material; the first-named substance being preferred. He also interposes a strip of sponge or a coil of tow, cotton, or other similar material, between the recess and a groove in a top running plate and the channel before mentioned. By this means the supply of grease to the axle is moderated and filtered, so as to keep out all impurities. The upper edge or lip of the channel is also elevated above the flooring of the grease chamber, so that any grit or other injurious matters entering the grease-box will not pass down through the bearing-brass to the axle, but will settle upon the floor of the grease-chamber, from whence they can at any time be removed. There are pockets on each side of the axle-box, for collecting any grease that may pass off from the axle. These pockets, as well as the space above them, are packed with sponge, tow, cotton, or other similar material, for the purpose of taking up and redistributing the grease over the axle. The front plate of the axle-box has an inner projection for keeping the sliding bearing-brass in its proper position, and there is a metal washer fitting a shoulder on the axle, and free to slide vertically within a recess at the back part of the axle-box, so as to prevent the escape of grease therefrom. As the bearing-brass becomes worn, and lets the axle-box down upon the axle, this washer moves up within the recess and maintains a nearly grease-tight joint.

In an arrangement forming Vigurs' second improvement, the grease is supplied through an opening to the grease chamber, from whence it passes downwards through two side channels to the axle. The bearing brass slides from the front into a dovetail groove in the axle-box, and is formed double so as to present two bearing surfaces. When the first surface is worn out the brass can be drawn out of the groove in the axle-box, turned down, and replaced, presenting the fresh bearing-surface for use. There is an outside metal washer fitting a journal on the shoulder of the axle, and free to move vertically with it as the bearing-brass becomes worn upon two dovetail studs in the back of the axle-box, so as to prevent the escape of grease therefrom.

Vigurs' claims are—*Firstly*. The general internal arrangement of the grease-chamber and passages, as described.

*Secondly*. The general internal arrangement, combination, and adaptation of parts, for regulating, filtering, and supplying grease to the axle, through sponge, on or at the side of the bearing-brass, as described.

*Thirdly*. The mode of constructing the cover of the grease-box with a separate hinge, as described.

*Fourthly*. Constructing bearing-brasses with two bearing surfaces.

*Fifthly*. Constructing bearing-brasses to slide into the axle-boxes from the front.

*Sixthly*. The application of a metal washer, either internally or externally, at the back of the axle-box, to prevent the escape of grease therefrom, as described.

Leaving out of the question all but Mr. Vigurs' last claim, which is the ground of Messrs. Normanville and Co.'s complaint, the difference between Normanville's specification and that of Vigurs is that the former *fixes* a vulcanized India-rubber collar to the box, so that as the axle varies its position in the box by wear, the India-rubber yields elastically; Vigurs simply fits a metal collar to the axle, and it rises or falls with the axle in a squared slot projected over the axle at the back of the box while the axle revolves within the collar. On the supposition that the rapid revolution of the axle will not wear the collar, and that a fit of the collar can be maintained in the slot, in spite of the rough movement and tilting in travelling, this in principle would be right; but this is merely supposition, for it

lacks the important principle of elasticity, and cannot be permanent. It would wear fast, enlarge the opening, hang by the upper part, and leave a leak at the lower side.

Mr. Reeves having purchased the patent and succeeded in obtaining orders for Vigurs' boxes from the Great Northern Railway, to be manufactured by Mr. Williams, of Goswell-street, in competition with those of Normanville, that gentleman, with his coadjutors, Messrs. Bruff and Parsons, has taken proceedings in Chancery on the way to the Common Pleas.

An injunction being moved for under the allegation that Mr. Normanville was the first and original inventor, a kind of compromise was come to, Mr. Williams agreeing not to apply the name of Reeves to the boxes in question, and to hold the royalties in hand till such time as Mr. Normanville should establish his claim in Court, which he intended to do with the least possible delay. The proposed object of this was to prevent annoyance to the Company.

We think that the name of Reeves should never have been applied. The law holds that none but the real inventor is to obtain a patent. If, after the patent is obtained, the sale of it alters the name, there is a deceit on the public. An inventor might hunt the records for ever, in the absence of information, as to the date and name of the specification. We think that it is as improper to put a false name on a patent as to put the word "patent" on an article that has never been patented. It is robbing the inventor of his repute. But neither Normanville nor the representative of Vigurs work according to their original practice. Normanville has changed from elastic India rubber to a non-elastic leather shield, which cannot be permanent, fixed to the axle-box; and Vigurs' representative has abandoned his metal collar, (and therefore his specification,) and applied one of *papier-maché*, moving up and down with the axle, and subject to tilting and wear in the box and consequent leakage, rather worse than the metal. Supposing Normanville to be the original patentee, and his patent valid, he could, as the lawyers say, "estop" Vigurs, because the manifest object is to hold grease; and Vigurs', if effective, would only be a mechanical equivalent for Normanville's. The change of name, which an inventor cannot sell with his patent, is giving a spurious repute to a non-inventor. Neither of these things are for the interest of the public.

We think that Mr. Normanville is so far right, inasmuch as his patent is prior to Vigurs', and the object is substantially the same—*to keep in grease by closing the back of the box*. But we are old patent agents, and have examined the list both before and after Mr. Normanville. After him we find the name of Barrans, also showing a grease-tight axle-box, which he does not claim, in connection with an arrangement for preventing end play of the axle by an end metal bearing between the axle-box and the axle-end, which he does claim. There is another contrivance, in the name of Mansel, combining the same processes as Barrans'. We hear also of the name of Hodge, with a leather collar fast to the axle-box, and varying from the plan of Normanville by a grooved iron collar round the axle to receive the leather collar, and a stuffing of cotton waste against the lower side of the axle, containing oil to insure its lubrication. We should like to know what name this patent stands in. If rightly informed, it is an American "dodge." Patents coming after, import little; but those going before are fatal. We find, then, that on the 22nd of December, 1847, Richard Wrighton obtained a patent for improvements in apparatus to be applied to railway carriages and engines, the specification of which, reprinted from a former notice of ours in the *Mechanics' Magazine*, vol. xlix., page 645,* is as follows:

The journal revolves in a brass step, fitted into the axle-box, which is cast in one piece, or otherwise so made as only to leave an opening on its face for the introduction of the journal of the axle. A ring of vulcanised India rubber is compressed between the face of the axle-box and another ring, which works against a shoulder on the axle, and against which it is pressed by the elasticity of the India-rubber ring, and in both of which the axle freely revolves; there are apertures at the sides through which the grease passes from the grease-box to the journal and interior of the axle-box. The object of making the grease pass down the sides is to save diminishing the bearing surface of the brass by drilling large grease holes. A spring rests on a plate which covers the grease-box, and carries the grease cover, made to fit sufficiently accurate to exclude dust and dirt, the whole being secured to the axle-box by bolts.

In applying the axle-box, the metal ring encircled by the India-rubber ring should be first put on the axle; the axle-box with the brass step in its place being filled with grease, is then to be applied to the journal and pressed towards the nave of the wheel, compressing the India-rubber ring until the bearing drops on to its seat. The shoulder of the journal will prevent the axle-box

* We have omitted the engravings and letters of reference which appeared in the description first published, in order to reduce the space occupied.

from being forced back again by the elasticity of the India-rubber ring, which will press on one side against the face of the axle-box, and on the other against the metal ring, and keep it close up to the shoulder on the axle, and prevent the grease escaping and dust or grit getting to the journal.

It is quite unnecessary to apply pins or fastenings of any kind to confine the India-rubber ring, the adhesion between it and the face of the box being much greater than the friction between the two metal faces.

(*To be continued.*)

## ARE THERE MORE WORLDS THAN ONE?

### NO. II.

After our necessary, though, we fear, tiresome introduction, we are prepared to enter at once into the free discussion of the subject, which, we hope, will possess sufficient interest to induce the reader to follow us. Are there, then, more worlds than one? Is there evidence to show, or analogy strong enough to lead to the inference, that the various bodies of the universe are inhabited by beings in any sense like ourselves, and therefore fitted to contemplate the goodness of the Creator, and enjoy the blessings He has secured to them in the physical arrangements to which they stand inseparably related?

When meditating the reply we intended to submit to our readers, our purpose was, at first, to divide our observations into those bearing on the physical, the metaphysical, and the theological conditions of the question; rising, as it were, by certain gradations from the strictly observed facts, through the conclusions of a dispassionate judgment, till we reached the doctrines of Inspiration, at a point where our own powers begin to fail, but where a clear light is thrown on all our antecedent steps in the path of reason, and an indubitable assurance given that our future progress is unattended with peril. But, on reconsideration, we found ourselves, in perusing the works before us, so rudely flung by our controversialists from one to the other of these divisions of the subject, that we were compelled to alter our arrangements. We were fearful that, to pursue all the arguments into their respective categories, would entail on us a task not only wearisome in itself, but unattended by results we should deem worthy the notice of our readers. We prefer, therefore, to meet the various reasonings that will arise in the course of the discussion, by laying a good foundation in the physical phenomena, and by then adhering pertinaciously to the conclusions suggested by them. We shall attempt to dispose of the case we wish to present in the following manner: we shall listen first to the chief arguments adduced on the negative side of the question, and then, being obliged to assume a high probability that the universe is inhabited or pervaded by some sort of intelligent beings, we shall seek to determine its value; and we shall see, perhaps, that the point to be reached, after all, will be inconsistent on the one hand with the flippant spirit shown by Dr. Whewell, especially in his prefatory dialogues, and on the other with the strange reveries and excited declamation of Sir D. Brewster. We believe we shall have to conclude that a review of the whole case will confirm our impression that, if inductive reasoning may secure for us some degree of certainty, it will much more deepen the conviction that, while the known bears so small a proportion to the unknown, a profound modesty is the chief virtue, as it will be the highest distinction, of the earnest truth-seeker.

May we, therefore, suppose our reader acquainted with all the phenomena to be kept before us by the respective disputants. Let us even imagine he has drawn them out into several distinct columns, in order to represent what we have already called the physical conditions of the case he has to adjudicate upon. Let us suppose, also, that he has placed the earth, as the starting point of comparison, not for the purpose of becoming eloquent on the subject of its wonderful adaptation to our life, happiness, and moral advancement, or even of making it the standard of all conceivable excellence in the universe, of which it is, in itself, so minute a fragment; but let him exalt it to the post of honour that, starting from our more certain knowledge, a glance may suffice, in some cases, for the determination of questions which otherwise might degenerate into the merest logomachy.

The first point to come under consideration is, whether beings like man can be proved to occupy or inhabit the planets and the other bodies scattered through space, and held together by our theories of the works of God. We say held together in our minds, because nothing is more evident in the volumes before us than the deep impression, always remaining uncontroverted, that the worlds around us constitute the grand unity of a divine plan. The controversy arises, however, at the moment when this admission is ungrudgingly made. Are we entitled, it is asked, to reason always from the little to the great, or to say, because we must feel the wisdom of God pervades the immensity of His works, that, therefore, we are to transfer what we know, and feel, and hope, or, in a phrase, what we really are, to

the remotest confines of space? Must the idea of humanity, however extended and refined, limit that of creative energy? Is man not only the microcosm of the ancients, but the compression into a miniature form of all the most advanced reasonings and highest aspirations of the meditative sage, or the hopeful Christian?

This is the question, then, at present under review. Now, we must proceed to say, that by a man we must evidently mean that creature of God whose form is shaped, and whose whole life is determined by certain material conditions—who, unless obedient to these, cannot happily exist, or become the instrument of a mighty intellect giving meaning to his acts, and rendering possible speculations like those calling forth its energies in the works before us. In other terms, there is a settled limit within which he can move, think, will, and which is drawn around him everywhere on the surface of our globe. He requires the vital air in just proportions—the moisture that not only spreads out in purling streams, deep rivers, or ever restless seas, but enters so largely into the composition of his own frame,—the relations of gravity affording to himself and all other things the stability necessary for their permanence, and yet leaving them, if endowed with motion, free enough to occupy the sphere necessitated by their respective functions,—the constant vicissitudes of day and night, of summer and winter, that he may be refreshed when sinking into the repose induced by his labours, or indeed by the very activity of the vital organs, and receive, in proper order and due proportion, the bounties of a Divine beneficence,—the aliment which he must seek, but which he finds growing out of the conditions of matter around him, and which he enjoys as meeting the very requisitions of a taste itself dependent on a nervous tissue resolvable into the same constituent principles,—and lastly, the beautiful order in the wonderful variety meeting his senses or stirring up the affections of his heart, so that while he feels he is a part of the dark dead matter on which he treads, and of the instincts bringing sometimes the brute creatures so near the sphere of his own intelligence, he can grow in knowledge, aspire in hope, become great in goodness, and be recognized as a blessing to his fellows, and a communer with his God!

Here, then, we may add, supposing we take up every possible condition of the case, we can easily understand the variations apparently to be allowed for in the life of man. For we do not deny that we can manage to exist at the North Pole, and then, rapidly gliding through all the intermediate temperatures, pass into the tropical regions, and that other modifications analogous to these may also be suggested without difficulty from a very different point of view; but then we say, that all these considerations, for which we have to make a correct allowance, are the very evidence we should desire to show that man being predestined to move over the entire surface of the earth, the Forethought that provides for him when he makes his appearance on any spot, has already arranged for his support and progress there. There is, therefore, a *mean estimate* of all terrestrial conditions, that may everywhere be taken as the definition of the man, putting him in harmony with, or rather making him a part of all natural laws. Preserving this level—with a power of diverging on either side, in the manner and to the length already intimated—we term him healthy, and expect the full development of his powers: and if, consequently, he cannot maintain this, or depart too far from the normal position implied by this, he sickens, and is in pain; he droops, and finally dies, to give place to others, who, being wiser, will reason out from his misfortunes all needful sanitary precautions or adopt all requisite medicinal restoratives.

Now, in saying this, let it not be overlooked, that we might, after the manner of our authors,* fall into some pleasant theological reflections, quite consistent with the truths of Revelation. We read—to take an illustration—that man, for example, Adam, the creature formed of the dust—was introduced to the earth in due order of processes; the present epoch, characterised by his presence, arising from previous conditions of geological life, and modified to meet the demands of the various forms now moving upon it. When he appeared, male and female, in the duality of his wondrous nature, it was not as an emanation direct from the Great Spirit, taking to itself, by a sort of elective affinity, the conditions proper for it, but as the child of flesh, composed of the various elements already existing around him; and then the glorious mind, coming warm on the breath of God, gave intelligence to the whole in the lovely symmetry and direct activities of the acknowledged Lord of creation. We see, then, that physiologically or religiously considered, the life of man grows out of the nicest balance of material forces, and that duty and moral heroism, in their widest sweep or most sublime aspirations, spring from, if they were not intended to be always subordinated to, the physical conditions of our globe.

Let our readers pardon us if we repeat, that here we possess the simplest *data* from which we are to reason on the man, made up of all the particulars at which we have

* *Vide* the Doctor's treatment of the facts bearing on the advance in space of the solar system in the "Dialogue."

been cursorily glancing. Now then, let them ask if they can transfer a creature like this to the planets with their satellites, to the double or triple stars, or to the nebulæ stretching away into the dim distance of the heavens? We ask them to study the facts in respect to the physical conditions of their own life, and determine for themselves whether there is ground for the affirmative, so sure and strong (we will not say so elevated), as to justify the angry outbursts of injured feeling, or the bitter recriminations of alarmed orthodoxy. We are prepared indeed to admit, that what we offer may seem a very unpretending statement of the argument; but let it not be forgotten, we are attempting to do the work neglected by our authors, who, losing themselves first in unfounded generalizations, or expatiating over unbounded fields of speculation, only refer to the established facts before us, when they have a purpose to answer, or a theory to uphold. They hardly allow their reader the comfort of feeling the good old earth under our feet, as the stand-point of all ratiocination, and not unfrequently, therefore, compel us to aver, that under their guidance we are becoming "wandering stars," plunging towards the darkness that must engulf, thank God! all theories, however beautiful in show, unbased on the common sense procedures of Inductive philosophy. And then again they would tie us down to the earth indeed; yet under the supposition that, sin-stained and unsatisfactory as we know it to be, its present phenomena might restrain the flight of the soul towards the Vast of being, in concentrating our regards on a spot that to a pious heart is of importance, as it teaches him to stretch above many of its influences and far beyond the limits set to it among the works of God.

The fact is, we know positively very little, as we shall make apparent hereafter, when alluding more particularly to Sir D. Brewster's speculations, of the real constitution or internal economy of the celestial bodies; and it may be, we grant, very difficult to bend an ambitious mind in childlike submission to the fact; yet after all, the question returns, whether the stars themselves, habitable or desolate as the imagination or sentiment may suggest, do not exist for the very purpose, among other ends, of inducing this opinion in the mind of an honest philosopher, and the heart of the sincere Christian. Socrates was right in teaching, that the oracle had denominated him the wisest of men, simply because he felt and had the ingenuousness to avow, after long research and the profoundest reflection, that he knew—next to nothing!

Let not the reader, however, misunderstand us, as if we subscribed to the argument of the author of "The Plurality of Worlds" on this branch of the subject. He, indeed, affirms the negative to its full extent, but he is not satisfied to reason from the simple elements of the case we would place before the reflective reader; but, starting from the wrong end of the universe, that is, hunting out some particular nebulæ to serve his turn, or dissertating very learnedly on the tail of a comet, he conducts us with all condescension to our poor little earth, that refuses to be comforted, although assured that on it alone the eye of God has rested complacently, and for it alone His hand has expended the treasures of His goodness.

In brief, if we comprehend him, the argument seems to be this:—"We cannot," he says, "form any notion of an intellectual being but through the projection of human consciousness beyond itself; the inhabitant of other orbs (if any) must, therefore, necessarily take the form, and discharge the functions of man; but that is impossible, all the circumstances of human history being considered. Nor is the supposition we require in the case before us one derogatory to the Divine wisdom, since we know that even the earth has been passing through successive geological epochs without a solitary inhabitant." And then the author proceeds to gather up the physical indications—or, we should rather say, a few of them, that may confirm his more abstract reasonings, or give a show of probability to his speculations.

Now we submit unhesitatingly, that this mode of reasoning is not only inconclusive in itself (as will be shown), but inconsistent with every principle of a correct inductive logic. What is it but theorising, where the slow process of observation should be carried on? What is it except assuming that speculations *à priori* should determine, and fix a limit to the formative hand of the Almighty, in respect to the beings that may be in some way allied to the matter He has already called into existence? Should we encounter the retort, that we know so little of the real constituents of the question when considered from a physical point of view; we reply, that then the whole subject is disposed of. Let us wait on calm and persevering researches for the facts on which alone we ought to reason; or if speculative habits must be indulged, let us so far respect the intelligence of our readers, and so far attend to the imperative demands of a severe science, as to keep distinctly separate from the few facts we have under command, the specious theories or even the most profound generalizations we can hazard, or for which we may secure the applause of the superficial.

Nor do we wonder, that the fundamental argument employed here, by the author, has been charged with atheistical tendencies, although it is no grand discovery after all, even if we suppose it suggested the first motive in writing the book. It merely reproduces the old rationalistic argument against the independent existence of God on a lower scale when applicable to man. A man's God, it is there said, is but the reproduction of himself in some external shape; it may be in the local deity of the Jew; the musing abstraction of the pensive Hindoo; the living energy of the plastic mind of the imaginative Greek; the childish fetish of the brutalized negro; or the lowest moral abomination in the worshipper of the devil.

If, however, man can only conceive of a Deity just like himself, he may not, of course, go beyond himself, and cannot, therefore, it is evident, conceive of the Pure Spirit of eternity. Be it remarked, we are not making the charge against Dr. W., that being quite apart from our modes of treating subjects of this description; and yet we must say, we hardly know how to square with the theory before us, the set orthodox phrases in the subsequent portion of his volume, where man is supposed to reach the very highest abstractions of the New Testament. And we do think, and will therefore repeat, that this will be accepted as a sad specimen of university dialectics, and withal a little amusing in its fallacious pertinacy. For so far does the author push the supposition (and, therefore we can be doing no wrong in extending our criticism on the point), that he proceeds to remark, that a creature like man being the only conceivable form of existence for all worlds, he must have, wherever and however you contend for his existence, the identical history that has characterised or accompanied his development on earth. The universe will be not even humanity enlarged in new conditions, but it must be the endless repetition of ourselves —just as we are—world without end. That the reader may not suppose we labour under any mistake in attempting to convey his meaning, or are seeking to convey a false impression from equivocal statements, we beg attention to the passage referred to below.*

Now we submit at once to the reader, whether the abstract view of this case do not require an extensive modification—so extensive indeed as to leave it the very argument we might urge for the opposite opinions. We mean, are we not justified in affirming that our idea of God depends indeed on all we can gather from the conceptions of our own free willinghood, active energy, and controlling conscience; but that we are bound also to add to our loftiest generalization gathered from these, the correlated idea of infinitude, or,—since we have no occasion here to make an idle boast of exactness,—of an indefinite extension to the full limit of our last capacity as thinking creatures? So, also, in reducing down the same thought to the nature of man, we may be correct in saying that our speculations about other intelligences will be always coloured by the conditions of our own conscious life, but that, nevertheless, this being once assumed or taken as granted, we can extend it to any imaginable length, till we reach the dim obscure on which so much of the sublime is always really dependent.

And let us add, moreover, that the requisition made by the author, that our human history should be carried out to its remotest consequences, is founded on a very curious misconception of the whole case. For, observe, the allusion to what man may have been in the past is imperfect, or, with the author's theological tenets, utterly useless, except with the limitation that the phenomena are, on his own showing, but the evidence of moral corruption in man; so that we are not considering the creature in the loftiest ideal of his excellence or moral beauty, but working his way towards a point, that once regained, will only place him where he stood before he fell into sin, or began to waste his life in tears. Now, who on the opposite side of the argument has ever imagined their worlds peopled, except by pure intelligences in calm sympathy with the will and in perfect harmony with the acts of the Creator, analogous to that manifested by man before the educationary processes of the present state were called for or applied? The fact is, Dr. W. first misapprehends the case, and then proceeds to show the absurdity of the consequences imputed to his opponents, although really emanating from his own error or oversight.

Besides, if the various phases of our humanity were conceded, without the preceding correction, would it not be possible to trip up the author by the analogy he presses on his antagonists from the consideration of geological facts? He says again and again the conditions of all other bodies may be comparable to that of the earth; let us grant it; he demands further that our concession should be drawn out to the length of admitting that the same law of development must be observed in them all; let us affirm it without scruple: but then it might follow, allowing the full force of the analogy, that at any one moment you might see in the bodies supposed a function of humanity —that is, some state of the man projected

* "Of Plurality of Worlds," ch. i.—v. *et passim.*

beyond himself, which may be imagined, described by you, or of which you can write the history: now, then, assuming each of these human conditions distinct in itself (since one man has as much right as another to assert the privilege of defining himself), what will you have as the result of your reasonings, except this,—that the world might be filled according to its varying material conditions with all the possible states of our humanity: not with its last possibility of perfection, to which our present aspect on the earth may bear a very remote relation; but we repeat, with all the immature conditions which, taken together, may give, or out of which may grow, the idea of the man we are seeking to identify with the works of God? What, we ask, can prevent the Doctor's opponents pressing home the argument upon him? You reason, they say, from our orb to other bodies beyond us; but on the same principle, we arrogate the right of saying, inasmuch as you declare the world was made for man, there is a strong probability, that according to your reasoning, what you predicate of that man may, in some of its particulars, and in the manner suggested, accompany every modification of matter.

But, leaving surmises we are almost ashamed to submit to the readers of the *Mechanics' Magazine*, would it not have been wiser to take higher ground, reaching, according to some, the same conclusions, though by a much safer procedure? The glorious idea of God is treated strangely by both these writers; they talk as if the little or the great could modify His purposes, who watches over the crawling, slimy worm, and yet regards the worlds so thickly scattered by His hand, as the merest hint to us of the Divine majesty. It may confound our reason and mortify our pride (we own) to surmise that the welfare of our little sphere is the chief end disclosed to us in the creation and conservation of the bodies around us; but yet we say (and this is all we would say here) that, in reference to the Eternal Mind, all this is both possible in the nature of things, and consistent with the idea we have formed of His wisdom and power.

Moreover, suppose there should exist a purpose beyond our present knowledge; might we not surmise, that the confession of ignorance made necessary by the humiliating fact, may be a great step in preparing us for some more glorious revelation hereafter of the designs of the Deity? In other words, have we any claim to put the theory of the universe on the following terms, and on these only; that it is within the conditions of the bodies themselves, or within the capacity of the percipient mind contemplating them, to explain the phenomena satisfactorily to our own reason at any precise moment? We repeat that our very perplexity, struggling as we are towards the Infinite Light, may be the most assuring indication, that there is a truth beyond that shall, once revealed, meet every requisition of the intellect, and even show the darkness that afflicted us was the indispensable preparation for the enjoyment of the very truth we had been seeking after.

Now, take the same argument on its lower level of the human mind. Matter is as nothing to God, nor is it an absurdity to say, that even the human mind is so transcendently important in itself and in relation to its Creator, that, in comparison with it, the world, or innumerable systems of worlds, shall weigh but as the dust of the balance; and that therefore, having this mind given, so to speak, in space, all other bodies may be subordinate to its uses, or adapted to its especial education. In all this we should be merely indicating the intrinsic excellence of the glorious soul, according to the opinions entertained and expressed concerning its nature by both these writers. Nor is it difficult to illustrate the thought: Suppose I find a rough shell unknown to conchologists on the shore of a newly-discovered sea; and polish it and bring out innumerable beauties in its well-arranged form, and play of light and colours; there it has been however for centuries waiting some intelligent eye to happen upon it. Or I climb the summit of a mountain never yet trodden by the foot of man,—or visit some uninhabited vale where I have to add to my botanical list many lovely trees and plants, the flowers of which have never charmed an eye, or the fragrance of which has never before exhilarated the spirits of any human being; or I may meet with higher organisms —the insect, the bird, the beast, that by their instinct hold me, as it were, in closer companionship; and then, having made my observations and gratified my senses, I have to reason out the thought, that all these forms have been brought under my notice there, and at that moment to stir up my faculties, affect my heart, or unite both in adoration and praise. Granting the intellectual use of anything is the prime end of its existence, and applying the reflection that if the Great Parent would teach his rational and responsible child, the man of the earth, it matters not to Him whether the lesson be communicated through the few bones, converting a Galen from besotted scepticism, through the merest particle of matter, moving in any form under the impulse of His will, or, rising in the application of the same principle, through the wonderful collocations of worlds and systems

the most astounding to us, we feel the universe itself is but the exposition of His generous resolves toward us. We have been arrested we feel, by His love; our hearts have been softened; our lives purified; our aspirations strengthened: in a word, we have been placed in the arms of His mercy, so that we can afford to look down, and see the stars falling, like "figs from heaven;" and the whole fabric itself dissolving away into the chaos from which it emerged, leaving the immortal mind in its own heaven of sancity, and on the bosom of its God!

(*To be continued.*)

## EXPLOSIVE SHOT FOR CANNON.

William Tibbals, of South Coventry, Connecticut, has taken measures to secure a patent for explosive shot for cannons, which possesses peculiarities different from the other explosive shot heretofore tried. It is conical, hollow, and contains powder; has a nipple on its point, and is covered with a jacket of soft metal which has flanges, and which allows of the shot being rammed down so tight as to prevent windage, but not affect the explosion of the percussion cap on the nipple of the ball. The shot is discharged by a charge of powder behind it, and when its point strikes an object, the soft metal case is driven down forcibly on the cap, which explodes, ignites the powder in the hollow shot, and then it explodes, scattering destruction all around.—*Scientific American.*

## IMPROVED FIRE-ARMS.

Among the many improved plans of fire-arms which have been brought before the public within the past year, we have to record another by Daniel B. Neil, of Mount Gilead, Ohio. It has for its object the firing of two charges, one after the other, from the barrel in which they are placed, by means of a common gun-lock. Two priming holes are bored in the side of the barrel, and two charges are inserted at once. The lock is so arranged, with a hammer having two heads, as to strike the cap of the first nipple on the side of the barrel, and discharge the first ball, and then to strike the nipple of the second priming orifice, and discharge the second ball. This one-barrelled gun is intended to possess all the advantages of a double-barrelled one. It can be charged with ball or shot. Applied to fowling pieces, it is believed to be an improvement of great value. Measures have been taken to secure a patent.—*Ibid.*

## ON THE CONSTRUCTION OF WAR-ROCKETS.

*To the Editor of the Mechanics' Magazine.*

Sir,—I quite coincide with you in the opinion that "Alma's" investigation of the circumstances affecting the motion of the war-rocket contains a very vitiating error. In fact, I am persuaded that he has been conducted to a conclusion which is exactly contrary to the truth. I was, however, pleased to observe that "Alma's" attempted explanation was *based* upon sound mechanical principles; his failure arose from the neglect of some of the circumstances of the case. With your permission, Sir, I will endeavour to establish these assertions.

Accepting "Alma's" description of the rocket, we have, it is quite true, to consider the motion of a moving body in which the point of application of the motive force is, while the greater portion of the path is traversed, in the rear of the centre of gravity. But there is another fact which "Alma" has altogether neglected; it is this,—*the motive force always acts in the direction of the axis of the rocket.* This condition being borne in mind, "every one acquainted with the laws of mechanics" will be aware that a body acted upon by such a force, so applied, is *not* "likely at any moment, should the slightest deflection in its path occur, to be affected with a rotary motion round its centre of gravity," unless, indeed, the cause of the slight deflection be permanent in its action, which is not, I presume, what "Alma" intended. For my own part, I am quite unable to believe that a force acting upon a body always in a line passing through its centre of gravity can in any way generate in the body a rotary motion about that centre.

I will proceed a little further, and endeavour to show that the stability or instability of the rocket's course depends upon the relative positions of its centre of gravity and its centre of lateral resistance.* It is evident, Sir, that if after the rocket has started on its path a change in the direction of its motion be in any way produced, that the body will thereafter be affected with two velocities,—one in the direction of its original motion, and a second in that newly assumed by its axis. The first of these velocities may be resolved into two parts, one of which is perpendicular to the rocket's axis in its new position. This, then, will produce a lateral atmospheric resistance upon the side of the rocket, and this resistance (considered as a resultant of all the elementary resistances brought into play),

* In estimating the centres of gravity and lateral resistance, the guiding-rod must, of course, be supposed to form part of the rocket.

will act through a certain point in its axis. Now it is plain that if this point be not identical with the centre of gravity, that the said resistance will necessarily generate a rotary motion round the latter, tending to increase the departure of the rocket from its original path, if it fall before the centre of gravity, and to diminish the departure, if it fall in the rear of it.

I am sorry that I cannot conclude my letter with the same satisfaction as "Alma" probably experienced in drawing his to a close; for I have no means of pointing out a method of construction which, in my judgment, would produce war-rockets capable of being projected with *certain accuracy* against an object, were it ever so desirable not to miss one's aim (for instance, were the Imperial Palace of St. Petersburg within range); for it is evident that while the centre of lateral resistance always occupies the same position in the body, the centre of gravity is (after the discharge of the rocket) continually travelling forwards, in consequence of the consumption of the mixture with which it is charged. All that can be said in the matter is this: if the rocket be so formed that the two centres which we have been mentioning are situated in the same transverse plane, or if the centre of gravity be before that of resistance, then the atmospheric resistance brought into play will always tend to restore the projectile to its original path, because, as the combustion of the rocket composition advances, the distance the centre of resistance is in the rear of the centre of gravity increases, and the amount of the *departure* will therefore, as we have seen, be diminished.

The foregoing appears to me, Sir, to contain an accurate account of the question brought forward by "Alma." I am, however, quite free to admit that, like him, I may have neglected some important fact or condition, if so, I shall be glad to see the defect pointed out. I sincerely hope the interest excited among your readers by this subject will have been so great that I shall be pardoned for having troubled both you and them with so lengthy a letter.

I am, Sir, yours, &c.,

DEJERB.

## NEW STEAM ENGINE.

*To the Editor of the Mechanics' Magazine.*

SIR,—An idea has floated for some time in my mind, which perhaps some of your readers may be able to turn to practical use. Those who are aware of the construction of Bourdon's manometer (exhibited in the Exhibition of 1851), are aware that if a metal tube partly filled with water, closed at both ends, as in fig. 1, and of thin elastic material, be heated so as to increase the pressure within it, the form of the tube will alter from that given in the figure to that represented by the dotted lines.

The force with which the tube will open depends on the pressure and the resistance of the material. If we could so fashion the tube as to make it perfectly elastic, then the force with which it would expand would depend wholly on the pressure, for the resistance of the material would be returned

Fig. 1.

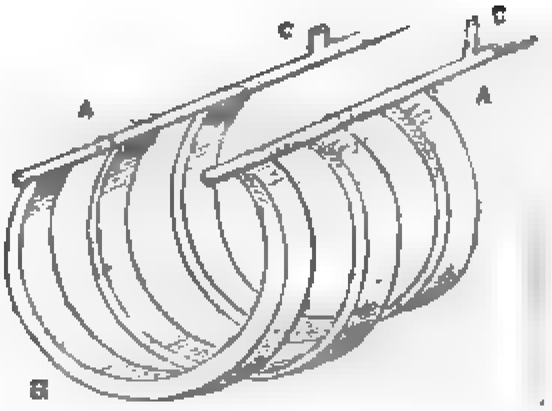
to us in available power, in the shape of the elastic recoil, to its original position when the pressure was removed.

Now although it is not possible to obtain a perfectly elastic tube for this purpose, and consequently there must always be more or less of the internal pressure lost by being expended on the particles of metal, yet it appears to me that the mode of using steam pressure thus presented to us, may be very usefully employed where heat is inexpensive, but where simplicity in the machine, extreme portability, and little wear, are objects of moment.

I believe that for many purposes of the laboratory and of the workshop, a small portable steam engine might be constructed, which would have the boiler and moving parts all in one, and that the extension of Bourdon's idea, on a greater scale, may yet be effected, even for the largest engines.

Fig. 2 represents enough of such a steam

Fig. 2.




engine to show the *rationale* of its working, and I have omitted in the representation the

rods for applying the motion generated, as well as the few parts necessary for regulating the motion itself.

A A are two straight tubes closed at each end, and into which, at short distances, open the ends of a series of flat circular hollow belts, made of thin copper or sheet iron, the end one being at B, and each of them constructed like the tube in fig. 1. Through C C pour water into all the belts, and let the fuel be placed in the nearly cylindrical-ribbed boiler, formed by the belts themselves.

If C C be closed, the pressure of the steam will cause the belts to expand and to draw A A apart. If C C be now opened, the tubes, A A will return to their original position, and if this alternate closing and opening of C C be continued, there will be a corresponding expanding and contracting of the belts until all the water is exhausted.

The communication of this motion of A A to a fly-wheel or other machinery, for regulating the speed or applying the force, and the means of working two stopcocks at C C, for the alternate opening of the same, are steps too evident to be further mentioned. The only part of this construction which seems to me original, is the proposal to make the boiler part of the moving machinery, and this suggests the application of such an engine to innumerable purposes. Thus a boiler of this sort might constitute one side or the back of a kitchen fire and turn the roasting-jack, or partly surrounding a gas lamp it might work signals, or, furnished with wheels, it could be formed into a toy locomotive, or used in any other way where the minuteness of the parts of a common steam engine, when on a miniature scale, is a bar to its construction and a source of trouble in its use.

The tubes, being filled with water and steam, would not be easily destroyed by the heat, and probably the trifling motion at their lower peripheries would be useful in keeping the fuel constantly stirred.

I am, Sir, yours, &c.,

J. M.

Temple, Oct. 24, 1854.

[An engine based upon the same principle as our correspondent's was exhibited in the French department of the Great Exhibition of 1851; and we remember having somewhere seen the model of another more recently. There is, however, an important difference between these and "J. M.'s," for while he proposes to generate the steam necessary for working the engine, within the tubes, the French engine was intended only for rendering available steam generated in an ordinary boiler.—*Ed. M. M.*]

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## OF THE COMBUSTION OF GAS WITHOUT SMOKE.

*To the Editor of the Mechanics' Magazine.*

Sir,—Having referred, in your last Number, to the furnaces of Mr. Woodcock, so favourably noticed by Mr. Mansfield; and having shown its identity, in principle and operation, with my expired patent (see Dr. Ure's "Dictionary of Arts,"—"Smoke Nuisance"), I now offer some remarks on Mr. Mansfield's letter, in your Number of the 14th ultimo. In that letter he treats, 1. On Mr. Woodcock's furnace. 2. On the use of hot air; and, 3 On smoke: and as he is the first writer who professes to consider the subject of smoke in its chemical bearings, his remarks demand deliberate attention.

"Most of those obstinate chimneys," he observes, "plead ignorance of the laws, not of the land, but of nature, and say, they do not know how to burn their own smoke; but some of them, I have heard, are wise in their own conceit, and go so far as to aver that the consumption of smoke is a thing impossible; and that there is still a law of nature, as yet unrepealed, against it. Now this last notion *is not true.*"

Mr. Mansfield here courteously transfers his strictures from persons to those chimney stacks who are "wise in their own conceit." Nevertheless, he fairly throws down the gauntlet, and I accept the challenge.

As there is some confusion in terms in Mr. Mansfield's letter, which should be cleared up, I will assume, in his favour, that when he speaks of "the consumption of smoke," he really means its combustion, chemically effected. The consumption of fuel is an admissible phrase, as it refers to the *quantity* used. The consumption of smoke, however, is, in terms, unscientific, unchemical, and incorrect; and its use, at least in the writings of scientific men, is much to be deprecated. In truth, it has led many ingenious patentees astray, in search, literally, of an *ignis fatuus*,—the combustion of an incombustible. Of this confusion in terms we have daily proofs, and even see it running through every clause in Lord Palmerston's Act, which absurdly enacts that "every furnace shall, in all cases, be constructed, or altered, so as to consume or burn the smoke arising from such furnace." The truest and best defence, then, on an information against an offending chimney would be, that the Act seeks to enforce an impossibility.

Mr. Mansfield observes, "I only wish to point out that the smoke of boiler furnaces, of the common construction, may, by a new and most simple contrivance, be perfectly consumed;" adding, that by it "the most voluminous smoke (meaning, I suppose, the blackest) may be utterly consumed with ease

and comfort." *In limine*, I dispute this claim in favour of Mr. Woodcock, the "simple contrivance" being already claimed in the specification of my patent of 1839, and since applied in thousands of cases, numerous instances of which are given in my late treatise on the Combustion of Coal.

It is manifest that Mr. Mansfield has fallen into the common error of confounding the terms *gas* and *smoke*, and that what he alludes to as effecting the "consumption of the smoke," is literally and truly the combustion of the gas. If Mr. Mansfield, instead of taking the word of others, will judge for himself, and look into a furnace in action, where the air is properly introduced, in mode and quantity, he will at once be convinced of his error, and see that, instead of the smoke being consumed, it is the gas that enters into chemical union and combustion, precisely as in an Argand burner; and as Mr. Mansfield has himself observed, when he says, "The result is, that a current of highly-heated air, which passes through the tubes in the furnace, escapes at the back of the bridge through the perforations," he having previously stated that "the back wall or plate is perforated with numerous holes." With the exception of the term being "highly heated," and which is not the fact, he has here given a correct description of the mode adopted by me, and long since reduced to practice; and which I assert is the only mode by which gas can be brought into combustion within a furnace or its flues. He then proceeds: "This hot air mixes with the gases from the furnace, which hold the smoke in suspension, and there burn it, converting the smoke into flame." Now this, literally, is burning the smoke before it is formed or generated. By this new theory, then, we are hereafter to consider that the merit of our gas-burners consists in mixing the air with the gas which holds the smoke in suspension. This "holding the smoke in suspension" is certainly an ingenious theory, but as certainly is not borne out either chemically or practically. Here it is manifest that Mr. Mansfield, when he speaks of "holding *the smoke* in suspension," means holding *carbon* in suspension. Carbon, however, is not smoke. It is, on the contrary, the smallest and most insignificant, either in volume or weight, of the constituents of smoke. Embarrassed by the confusion of terms, Mr. Mansfield strangely enough adds, "The principle here embodied is the same as that which Argand introduced into the construction of lamps." Certainly, Argand never even dreamt of the combustion of smoke. Whatever may be the confusion arising out of this loose mode of expression, we have here a distinct admission that it is the gas that enters into combustion. Whether it has, or has not, the smoke in suspension, we need not stop to inquire.

Following up the inquiry, Mr. Mansfield, as a preliminary, justly observes, "It is necessary to understand what smoke is." To this inquiry he will find I have, under high chemical authority, given much attention in my treatise. Instead, however, of Mr. Mansfield adhering to his text, he has gone into an elaborate and ingenious detail of the constituents of coal and coal gas, and the numerous classes of hydrocarbons into which they may, chemically, be resolved. All this, however, is beside the question at issue. What it is essential here to know is, that a gas (carburetted hydrogen) is generated or impelled from the coal in the furnace, as it is in the retorts of the gas-works; that it is with this gas we have to deal; and, further, that if the air be properly introduced, the combustion of the gas will instantly be effected; and, consequently, the generation of black or coloured smoke will be avoided. That, in fact, the whole question is not of bars or bridges, but of aiding in the mixing and union of the constituents of the gas and the oxygen of the air, in due time and quantity.

Gas must first be converted into flame by the combustion of its hydrogen; after which, this flame, if cooled down below the temperature at which its incandescent carbon will combine with the oxygen, will then be converted into the black element of smoke. The existence of the three bodies, gas, flame, and black smoke, may be shown apart from each other, and in their consecutive formations. For this see my treatise. Smoke, then, may be defined as the gross products arising from the imperfect combustion of the gas. These products are, steam, carbonic acid, and nitrogen, all incombustible, and in large quantities, together with carbon, in a comparatively minute quantity. To infer, however, that smoke is capable of combustion, because one, and the very least of its ingredients, is carbon, would equally justify our saying that carbonic acid is combustible, seeing that it also contains carbon, and even in much greater proportions.

In my next, I propose examining Mr. Mansfield's views with respect to hot air.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, Nov. 6, 1854.

## ON THE FORMATION AND COMBUSTION OF SMOKE.

*To the Editor of the Mechanics' Magazine.*

SIR,—Your readers will no doubt feel obliged by your consideration in placing

before them an engraved sketch and description of Mr. Woodcock's arrangement of apparatus for "consuming smoke;" it will enable them to examine all the points of novelty (if any) contained therein. After doing so myself, I see little to make me alter my views, previously expressed, but will endeavour to make the tests of experiments bear upon the subject.

In the first place, then, it has been proved that the introduction of heated air is quite contrary to all our knowledge of chemical laws, which tend to prove that for a certain quantity of fuel (say 1 lb.) it requires a certain number of cubic feet (about 150) of air for its consumption. Now we know that if we increase the temperature of the air, we also increase its bulk in a much greater ratio, and the passages that would do for the introduction of the *cold* air would then of course be much too small for the hot air; besides which, the former is more under control than the latter, it being almost impossible in the arrangement shown to say, at any time, what temperature the air has on its admission behind the bridge (marked C); but why increase the bulk of air by heating at all, when we know that cold air will enter more readily into combination with the gases arising from combustion? Experiments, again, prove to us that for a certain area of grate, a proportionate area of bridge-passage is required for the before-mentioned gases; but from the area shown in the sketch (marked C), Mr. Woodcock seems to ignore this rule altogether, by allowing such a small fixed aperture. Any impediment or angle opposed to the draught or passage of the gases under the boiler must be fraught with evil; take the hanging bridge marked D, and see what effect it will produce; it will have the defect above-mentioned, and at the same time it will also have a tendency to change the direction of the current of the gases, which will be made to pass over the bed of brick work, and not over the surface of the boiler, as it ought to do. The only good its use will produce will arise from what is before pointed out as a defect, impeding the passage of the gases, until the combination of the heated air takes place with the products of combustion. To conclude, I am quite of opinion that were the hot air chambers entirely removed, and the introduction of atmospheric air substituted, a better and more economical result would be obtained, both as regards the consumption of fuel and the prevention of smoke; and Mr. Woodcock would therefore do well to take the subject into his consideration.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, Nov. 1, 1854.

P. S. As you wish your correspondents to be as brief as possible, I have avoided entering into the mere theory of the subject, but should you wish, I shall be glad to transmit you a few considerations on the construction of boilers generally, as they are at present used. E.

[We shall be happy to receive a communication, on the subject referred to, from our correspondent.]

## MARSDEN'S FIRE ENGINES.

*To the Editor of the Mechanics' Magazine.*

SIR,—I noticed among the list of patents, No. 480, p. 305, in the *Mechanics' Magazine* for September last, one, taken out by Messrs. Marsden of Liverpool, for improvements in fire engines, which principally consists in the feed and ejection water ways being cast with the platform-plate on which the forcing cylinders and air vessel are bolted; all other parts appear similar to what have been before the public years past. About fourteen years ago, I made a fire engine (which is still in use) with the water ways cast in, and with the platform-plate, on which the cylinders and air-vessel are bolted, similar to the above, and which I did more for compactness than anything else, not thinking it worthy of patenting. It works very well.

I am, Sir, your, &c.,

JOS. BROWN.

Maidstone, Nov. 2, 1854.

## CUTTING THE TEETH OF WHEELS.

[WE have received several replies to the inquiry of our correspondent upon the above subject in our last Number, including three from René Cherbonneau, J. E., and S. Long, watchmaker, Putney, which are substantially the same as the following from Mr. Webster, the well-known chronometer-maker, and Mr. Powell.]

*To the Editor of the Mechanics' Magazine.*

SIR,—Your correspondent a "Wheel-cutter," wishes to cut a wheel of 735 teeth with an engine divided to 720.

$$735-720=15,$$

$$\text{and } \frac{15}{735}=\frac{1}{49};$$

therefore, if he divides a plate into 49 equal parts and moves it round 48 divisions for each tooth, by a little reflection he will perceive that he has cut 49 teeth in the same space that he would have done 48, if he had moved it round a whole circle for each tooth—

and $15 \times 48 = 720$, the divisions of his engine, and $15 \times 49 = 735$, the number of teeth he quires.

I am Sir, yours, &c.,

R. WEBSTER.

74, Cornhill.

*To the Editor of the Mechanics' Magazine.*

SIR,—In reply to a letter from a "Wheel-cutter" in the last number of your Magazine, in which he requests to be informed how to cut a wheel with 735 teeth, I beg to give him a method I have frequently adopted where the number of teeth required is one which will not multiply into any of the divisions of the locking-plate.

He states that his engine has a plate, with a worm on its edge of 720 threads, capable of being turned by a screw and handle. On the end of the screw, opposite the handle, is a locking-plate, &c.

It is evident, that if the handle be turned entirely round at each tooth cut, the wheel produced will contain 720 teeth. Now, the number required, 735, is fifteen more, which excess is exactly a forty-ninth of the number of teeth required; therefore, if the locking-plate be removed, and a wheel substituted containing 49 teeth, it will be only necessary, at each tooth cut, to turn the handle of the screw once round all but one tooth of the wheel.

Should a "Wheel-cutter" not have a wheel by him containing 49 teeth, it will be a difficult thing for him to make one, and the following will be found the least expensive method of obtaining a substitute.

Take a slip of clean paper, about half an inch broad, and measuring exactly 6⅛ inches long, and mark off along one edge of the paper 49 equal parts, each part being one-eighth of an inch long, which may be easily done by a common foot rule. Take a disc of hard wood, about half an inch thick, and turn it down in the lathe to about two inches diameter, from which size reduce it very carefully and gradually until the two ends of the divided slip of paper will exactly meet when wrapped round the disc, where it may be temporarily secured by a little paste or gum.

If this disc be then placed upon the end of the screw, its divided circumference will answer every purpose of a wheel of 49 teeth, and the required wheel of 735 teeth may be cut in your correspondent's machine.

I am, Sir, yours, &c.,

EDWARD J. POWELL.

Admiralty, Nov. 6, 1854.

P. S. I think "A Wheel-cutter" has fallen into an error, when he states that one turn of the locking-plate at each cut produces a wheel of 720 teeth, half a turn 360 teeth, and a quarter turn 180 teeth, &c. It would require two turns to cut a wheel with 360 teeth, and four turns for one of 180 teeth.

E. J. P.

## ARTIFICIAL PALATES.

*To the Editor of the Mechanics' Magazine.*

SIR,—Having just received my October Number of the *Mechanics' Magazine*, among the abstracts of "Specifications of Patents recently filed," I see that of Simeon Mosely, of Hull, York, surgeon-dentist. It is therein stated that the invention consists in forming artificial palates, with a series of small indentations of different depths; and, as such has been my plan of making artificial palates for at least the last five years, it is clearly evident that Simeon Mosely is forestalled, and that the invention cannot be claimed by him, either as original, or as a recent improvement.

I am, Sir, yours, &c.,

JOHN WAINWRIGHT,
Surgeon-dentist.

3, Price-street, Birkenhead.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

CHILDS, JAMES, of Belmont, Vauxhall, Surrey. *An improvement in subjecting fatty and oily matters, and matter containing oils or fats, to pressure.* Patent dated April 11, 1854. (No. 846.)

*Claim.*—Subjecting fatty and oily matters and matters containing fats and oils, when immersed in water, to pressure.

NOEDL, CHARLES ANTHONY, of Upper St. Martin's-lane, Middlesex. *A portable vapour bath.* Patent dated April 11, 1854. (No. 847.)

In employing his apparatus the inventor places it beneath a chair, sets light to the wick of the lamp, and when he finds steam emerging from the vessel, he seats himself, undressed, upon the chair, and envelopes his body, the chair, and the apparatus, in a blanket or light cloak made for the purpose, and "in a short time the vapour coming into contact with his body, has the effect of exciting profuse perspiration; he then sponges himself with cold water, and finally dries himself with a cloth."

MITCHELL, JOHN, of the Assay-office, Dunning's-alley, Bishopsgate-street, London, assayer. *Improvements in machinery for pulverizing, grinding, amalgamating, and washing ores.* Patent dated April 11, 1854. (No. 848.)

This invention relates to improvements

in that class of machinery in which spheres are used in a circular trough, and consists mainly in giving motion to such spheres by means of cones which are free on their axes, or of inclined surfaces.

PEILE, JOHN JOHNSON, of Whitehaven, Cumberland, iron-merchant. *An improved construction of lifting-jack.* Patent dated April 11, 1854. (No. 849.)

A full description of this invention will hereafter be given.

WHITWORTH, THOMAS SCHOFIELD, of Salford, Lancaster, mechanic. *Improvements in the mule for spinning and doubling cotton and other fibrous materials.* Patent dated April 11, 1854. (No. 850.)

*Claims.*—1. The use of a stop with an elastic abutment, for determining the motions of the escapement-wheel. 2. The employment of a rotatory surface, for guiding the stop attached to the "long lever" into the required position. 3. The employment of a screw of varying pitch, for shifting the point of attachment of the winding-on chain.

SCOTT, URIAH, of Camden-town, Middlesex, engineer. *Improvements in the adaptation of elastic material to boots and shoes, and shoes for horses and other animals.* Patent dated April 11, 1854. (No. 851.)

The inventor takes a plate (for which a piece of leather may be sometimes substituted) and secures it to the boot or shoe. This plate is fitted with a socket and a screw corresponding to it, and the screw is provided with a flange or head, by which a second plate is attached to the former, and between the two plates elastic material is introduced.

MILLER, JOHN, the younger, of Liverpool, Lancaster, ship-builder, and MICHAEL BURKE, of Liverpool, cabinet-maker. *Improvements in machinery for transmitting motive power.* Patent dated April 11, 1854. (No. 852.)

This invention has reference to the construction of gearing for transmitting motion from the engines to the propeller-shaft in screw steamers, and consists mainly in using drums or wheels which are without teeth, but have their peripheries bearing hard upon each other, so as to transmit the motion by contact alone.

FOTHERGILL, BENJAMIN, engineer and machinist, and WILLIAM WEILD, engineer, both of Manchester, Lancaster. *Improvements in machinery for combing cotton, wool, flax, silk, and other fibrous materials.* Patent dated April 11, 1854. (No. 854.)

*Claim.*—A combination of mechanism, whereby the combing of one portion of the fibres is effected at the same time that another portion, previously combed, is being detached or drawn from the fleece or sliver, and whereby the combed detached portions are attached to each other, and delivered in one continuous sliver.

JAMES, WILLIAM HENRY, of Camberwell, Surrey, civil engineer. *Improvements in marine and other structures.* Patent dated April 11, 1854. (No. 855.)

This invention consists of certain improvements upon methods of uniting metallic surfaces, and manufacturing cellular plates and vessels, which were patented by Mr. James in July, 1845, and September, 1853.

BRIGGS, EDWARD, of the Castleton Mills, near Rochdale, Lancaster, manufacturer. *Improvements in machinery and apparatus for finishing yarn and thread.* Patent dated April 12, 1854. (No. 857.)

*Claims.*—1. The arrangement, adaptation, and application of machinery and apparatus for finishing dyed yarn and thread of spun silk, by subjecting the same to the action or operations of moisture, gassing, heat, and friction. 2. Apparatus for finishing and giving a gloss or lustre to yarn or thread, by passing the same round heated and grooved cylinders, and between twisted strands of fibrous or other material.

WHITESIDE, ROBERT, of Egremont, Birkenhead. *Improvements in treating or purifying wheat and other grain.* Patent dated April 12, 1854. (No. 858.)

*Claim.*—The employment of chlorine and charcoal for purifying wheat and grain.

COLTMAN, WILLIAM, of High-street, Leicester. *An improvement in knitting-frames.* Patent dated April 12, 1854. (No. 859.)

This improvement consists in applying a bar fixed to the frame at the back of the sinkers, such bar having formed upon it, or fixed to it, as many nibs or pressing-bits as there are needles, so that as the frame comes forwards these nibs or bits will pass on the beards of the needles, whilst in the return of the frame the bar and nibs or bits will rise up with the frame and pass back to the proper position, to again come forward with the frame.

COLT, SAMUEL, of Spring-gardens, Middlesex, gentleman. *Improved machinery for cutting or shaping metals.* (Partly a communication.) Patent dated April 12, 1854. (No. 861.)

This invention consists in the construction of very elaborate machinery, (mainly adapted to the formation of fire-arms,) a condensed description of which we shall endeavour to give hereafter.

PARKER, SAMUEL BREWSTER, of Deptford, Kent, chemist. *An improved apparatus for consuming smoke.* Patent dated April 13, 1854. (No. 863.)

A full description of this invention was given in our last number.

HANSEN, EMILE WILLIAM, of Saxe Gotha, engineer. *An electro-magnetic engraving machine.* Patent dated April 13, 1854. (No. 864.)

A full description of this invention was given in vol. 60, page 539.

COX, ARTHUR HAWKER, of Ship-street, Brighton, Sussex, chemist and druggist. *Improvements in coating pills and boluses.* Patent dated April 13, 1854. (No. 866.)

The inventor dissolves gum or resin which is insoluble in water or saliva, but capable of being readily acted upon by the juices of the stomach, in æther, alcohol, or other proper solvent, and the pills or boluses to be coated are immersed in it, or have their surfaces otherwise moistened with it.

GREENWOOD, JOHN, of Irwell Springs, near Bacup, Lancaster, Turkey-red dyer, and ROBERT SMITH, of Bacup, manufacturer. *Certain improvements in sizeing, stiffening, and finishing textile materials or fabrics.* Patent dated April 13, 1854. (No. 867.)

This invention consists in the employment of Indian corn or maize, finely ground and dressed, for the purpose of sizeing, stiffening, and finishing textile materials or fabrics, and also in the use of the same material in combination with any other substances commonly used for sizeing, stiffening, &c.

DEVINCENZI, GIUSEPPE, of Grosvenor-street, Middlesex, gentleman. *A method or methods of producing engraved, figured, and typographic surfaces for printing and embossing from and for ornaments; also certain machinery employed therein.* Patent dated April 13, 1854. (No. 868.)

This invention primarily consists in producing printing surfaces of various kinds by the action of acids, or by electro-chemical action, upon metallic plates suitably prepared.

GRIFFITHS, JAMES, of Moorgate-street, London, gentleman. *An improved portable measuring instrument.* Patent dated April 15, 1854. (No. 869.)

The instrument described by the inventor is used by placing the foot on one end of the tape measure, or on a foot pedal, or stirrup affixed to it, and raising one end of the instrument until directed to the point of which the height is required, keeping the instrument level by a central balance or plumb.

MEYER, HENRY, of Manchester, engineer. *Improvements in looms for weaving.* Patent dated April 15, 1854. (No. 871.)

*Claims.*—1. Apparatus employed for throwing the shuttle across the shed. 2. An improved mode of working the shuttles in any required succession. 3. Supporting the pricking stick on a double fulcrum. 4. An improved combination of machinery for preventing the stoppage of the loom when all the shuttles are in the shuttle-box furthest from the weft fork. 5. An improved combination of machinery for removing the weft threads out of the way of the weft fork.

CROISY, JOSEPH, of Paris, France, mechanician. *Improvements in machinery for manufacturing bolts, rivets, screw-blanks, railway pins, and other similar articles.* Patent dated April 15, 1854. (No. 872.)

This invention consists in effecting a mechanical arrangement by means of which a rod of iron, heated to a suitable degree, is cut into proper lengths to form bolts, rivets, screw-blanks, railway spikes, &c., after which the machine forms a head at one end of the small rod thus obtained, and pushes the finished article from the holder.

LAWES, THOMAS, of City-road, Middlesex. *Improvements in protectors for the head.* (A communication.) Patent dated April 15, 1854. (No. 873.)

The body of the cap described by the patentee is formed of cane, straw, basket work, and is so formed as to guard the head from being injured from falls or blows.

CHAPLIN, ALEXANDER, of Glasgow, Lanark, engineer. *Improvements in the application of cast iron to building purposes.* Patent dated April 15, 1854. (No. 875.)

*Claims.*—1. A mode of casting various sizes of iron building blocks or plates with distinctive numbers or marks upon them, to facilitate their arrangement during erection. 2. A mode of causing cast-iron erections to resemble those of ordinary stone or brick-work laid in courses, by employing castings, each made to resemble one or more blocks of stone or a mass of brick work. 3. A mode of combining iron plates with walls of inferior stone, brick or rubble work, so as to give them increased strength, together with an external appearance resembling any style of building that may be desired.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of London. *Improvements in priming fire-arms.* (A communication.) Patent dated April 15, 1854. (No. 876.)

This invention consists in employing a suitably-disposed tube let into the stock, and certain mechanism in connection therewith, for receiving and placing the percussion cap on the nipple of the gun or other fire arm.

BARNETT, FREDERICK, of Caroline-street, Bedford-square, Middlesex, gentleman. *Illuminated furniture, &c., for interior and exterior decoration.* Patent dated April 15, 1854. (No. 877.)

This invention consists in forming, in coloured glass or any other transparent material, the representation of fruit, flowers, &c., capable of being illuminated by gas led

through conduits, introduced in the course of construction, to be used in the construction of glass frames, picture frames, cornices, &c.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in the manufacture of steel and wrought iron directly from the ore.* (A communication.) Patent dated April 15, 1854. (No. 878.)

*Claim.*—The method of converting iron ore directly into steel by subjecting it, together with an admixture of carbonaceous matter, to heat in tubes or other suitably-shaped vessels externally heated, and thence transferring it, in a heated state and smelting it directly, into cast steel, or exposing it in the smelted or granulated state to a welding heat, to produce spring or wrought steel, by manipulating it into balls or loops, and converting it therefrom into bars or other forms by hammering, rolling, &c.

TIRET, GEORGE LOUIS FELIX, of Paris, France. *An improved canvas for embroidering.* Patent dated April 15, 1854. (No. 879.)

*Claim.*—"The application of figuring or coloured weft to any kind of embroidering canvas."

HAWKINS, THOMAS, LL.D., of Northfleet, Kent. *An apparatus for creating an upward draught or current of air in chimneys, which apparatus is also applicable to the purposes of ventilation.* Patent dated April 17, 1854. (No. 881.)

This invention consists in causing the wind to act against a surface slanting obliquely upwards, whereby its course is changed to an upward direction, the consequence being the formation of an upward current or draught of air.

BENTLEY, WILLIAM HENRY, of Bedford, engineer. *Improvements in cannons, guns, and other fire-arms, and in projectiles for the same.* Patent dated April 17, 1854. (No. 883.)

This invention comprises—1. A method of constructing breech-loading fire-arms with breech-plugs, worked by a screw or screws. 2. The addition to such fire-arms of an air-forcing apparatus, for the purpose of driving a current of air through the chamber and barrel of the gun after each discharge. 3. The construction of gun-carriages with hollow axles and wheels, for the conveyance of ammunition, stores, &c. 4. The construction of certain projectiles formed with spiral or other wings round them. 5. The coating of fire-arms with gutta percha or other similar material for preserving them from atmospheric action.

FULLWOOD, BENJAMIN, of Bermondsey, Surrey, manufacturing chemist. *Improvements in the manufacture of cement.* Patent dated April 17, 1854. (No. 884.)

*Claim.*—The manufacture of cement by calcining with coal, coke, breese, or other like fuel, chalk, or other carbonate of lime, and a metallic, earthy, or alkaline chloride or muriate, or chlorine, or muriatic acid, with or without the admixture of oxide of zinc, or other cementitious or colouring matter before or after calcination.

TANNAHILL, DAVID, of Glasgow, Lanark, engineer. *Improvements in lithographic and zincographic printing.* Patent dated April 17, 1854. (No. 886.)

*Claims.*—1. A mode of causing the impression rollers of lithographic and zincographic printing machines to traverse over a printing surface which has no longitudinal motion. 2. A mode of causing the impression roller or rollers of such machines to traverse from end to end of the machine, by means of screw shafts disposed longitudinally, and acting on the frame which carries the impression roller or rollers. 3. A mode of raising and lowering the tables or rollers of such machines, having traversing impression rollers, by means of cams actuated by the traverse movement of the frames carrying the impression rollers. 4. A mode of arranging two impression rollers, with their accompanying details in a single traversing frame in such machines, so that two pieces of fabric or two impressions may be printed at once.

DAVIS, CHARLES CHAPEL, of Bath, Somerset, gas engineer. *Improvements in portable blow-pipe apparatus.* Patent dated April 18, 1854. (No. 887.)

The inventor constructs a portable chamber, into which air is drawn by a suitable spring or springs, and from which it is expelled through a flexible tube by the closing of the knees, or the descent of the foot of the operator, or otherwise.

HEALEY, SAMUEL, JAMES, of Over Darwen, near Blackburn, Lancaster, machinist. *Improvements in apparatus applicable to steam boilers, for preventing explosions and saving fuel.* Patent dated April 18, 1854. (No. 888.)

The inventor allows steam to pass through valves to a piston working in a cylinder placed on the top of the boiler, or in any other convenient position, and connects the piston-rod to the fire-doors by means of levers or any suitable connections, and thus regulates the draught.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and shoes, and in the machinery or apparatus connected therewith.* Patent dated April 18, 1854. (No. 890.)

These improvements relate, first, to a novel mode of paring or finishing the heels and soles of boots and shoes by machinery

instead of by hand labour; secondly, to placing round the dies used for shaping soles, a border for keeping the soles in their proper place; thirdly, to a novel kind of last; and, fourthly, to a machine employed in mounting the upper upon the last and inner soles.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in stitching, and machinery and apparatus connected therewith.* Patent dated April 18, 1854. (No. 891.)

These improvements relate to certain arrangements of parts for tightening the stitch and actuating the needle in stitching machines, and to a mode of passing the needles into and through the material, and also to combining stitching machines with ornamental tables.

HOWLEY, JOHN, of Camberwell, Surrey. *Improvements in the manufacture of a material as a substitute for leather.* Patent dated April 18, 1854. (No. 892.)

*Claim.*—Combining coloured paper pulp, or other suitable coloured pulp, with a woven or felted fabric dyed of the same colour as the pulp, so as to produce a surface similar to leather, capable of being embossed or otherwise ornamented.

WATT, CHARLES, of Gloucester-gardens, Gloucester-place, Kentish-town, practical chemist. *Improvements in bleaching hemp, flax, and other fibrous substances.* Patent dated April 18, 1854. (No. 893.)

This invention consists in bleaching hemp, flax, and other fibrous substances of a similar nature, such as jute, &c., by subjecting them, first, to the action of an alkali, and afterwards to that of chlorite or hypochlorite of soda, or other base.

GIBBS, HENRY HUCKS, of Bishopsgate-street, London. *Improvements in the manufacture of nitrate of soda.* (A communication.) Patent dated April 18, 1854. (No. 894.)

*Claim.*—"Dissolving out the nitrate of soda from the crude materials by steam."

FREERSON, JOHN, of Smethwick, mechanical engineer. *Improvements in steam engines.* Patent dated April 18, 1854. (No. 895.)

The framing of the inventor's engine consists of a bed-plate, two inclined pillars, and entablature, all cast in one. The pillars are hollow, and are arranged for the induction and eduction of the steam. The steam cylinder is fixed in an inverted position on the entablature. The throttle-valve is in the entablature, and the base-plate carries the bearings for the shaft, the governor, and the driving gear.

DENTON, WILLIAM, of Addington, York, machine wool-comber. *Improvements in combing wool and other fibres.* Patent dated April 18, 1854. (No. 896.)

*Claim.*—The use of a fixed blade or stop having a serrated or notched surface, when used in combination with drawing-off apparatus.

CHALLETON, JEAN FRANÇOIS FELIX, of Brughat, France. *Certain machinery for purifying and condensing peat, and also for conveying it.* Patent dated April 18, 1854. (No. 897.)

In carrying out this invention, the peat, having been put into a trough, passes under a rasping cylinder, which reduces it into a homogeneous paste by means of a set of blades fixed in the cylinder and in the seat past which it revolves. This paste falls on a screening sieve, and a rope or scraper is set in motion on this sieve for the purpose of forcing the mass through it and removing any vegetable substances not cut up, or any stones that may have been left in the mass. Under this screen is a dividing cylinder, set with points. The peat divided by this cylinder falls into a cleaning vat or tub, in which is an agitator, which, being hollow, serves to introduce into the tub a stream of water, which produces a rotary motion in the axis of the agitator. The earthy matters are thus separated, and the peat being lighter is carried away by the water running from the tub on to an endless grate or trellis, and is thence borne to a drying apparatus on movable cables.

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### PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CARR, THOMAS, of Liverpool, Lancaster, sharebroker. *Improvements in steering apparatus.* Application dated April 11, 1854. (No. 853.)

The inventor mounts the steering-wheel in the usual manner on a horizontal shaft, and at the opposite end of the shaft keys fast a chain-drum, and below this fixes another such drum on a longitudinal screw, which carries a travelling nut connected with the tiller, by means of a connecting-rod. There are two chains connecting the drums with one another, and each chain is coiled round its drum several turns, and has its extremity fixed. When the steering-wheel is turned, one chain uncoils from one drum and is wound on to the other, and *vice versâ.* Motion is thus communicated to the screw, and the nut is traversed in either direction according to the direction in which the steering-wheel is turned.

CRUGER, LEWIS, of Washington, United States. *A new and improved mode of attaching propellers to ships and vessels of all classes.* (A communication.) Application dated April 12, 1854. (No. 856.)

The driving shaft of propellers is by this improvement made in two parts, united out-

side of the ship by a universal joint placed between the vessel and the rudder or post, the outer short piece of the shaft passing through boxes in the rudder, and projecting a sufficient length to receive the propeller.

PIPER, JOSEPH, of Shoreditch, Middlesex, furnishing ironmonger. *Improvements in apparatus for affixing adhesive stamps and labels.* Application dated April 12, 1854. (No. 860.)

This invention consists of a combination of apparatus by means of which stamps or labels are taken from a suitable holder, moistened on their adhesive surfaces, carried to the place where the letters on which they are to be fixed are placed, and pressed on to make them adhere.

LETTS, GEORGE, of Northampton, mechanic. *An improved mole-trap.* Application dated April 12, 1854. (No. 862.)

This mole-trap consists of a pipe in which valves opening inwards, and incapable of opening outwards, are fitted near to each end.

ELLIOT, GEORGE, of St. Helen's, Lancaster, manufacturing chemist. *Improvements in the manufacture of carbonate of soda.* Application dated April 13, 1854. (No. 865.)

This invention has reference to the manufacture of carbonate of soda from chloride of sodium. The process consists in exposing the latter, mixed with about its equivalent of the carbonate of one of the alkaline earths and water, to the action of carbonic acid under pressure, thereby producing a sparingly soluble bi-carbonate of soda and a highly soluble chloride of the metallic base of the alkaline earth employed, and they are separated when still under pressure.

GOODRICK, CHARLES BRUTUS, of Old Kent-road, Surrey, engineer. *An improved artizan's tool, which may be used as a measuring rule, straight-edge, set-square, T-square, level, and plumb-rule.* Application dated April 15, 1854. (No. 874.)

The title sufficiently describes the character of this invention.

HEYES, GEORGE, of Aspull, near Wigan, Lancaster, manufacturer. *Improvements in the method of arranging and constructing the gearing or driving apparatus of machinery, to prevent accidents, and save time and expense in arranging the same.* Application dated April 17, 1854. (No. 880.)

This invention consists mainly in arranging, under the drums or pullies of shafting, guards or shields encircling their under sides, while on the shaft is fixed an arm or projection extending a little beyond the periphery of the drum, so that if any object by accident comes in contact with the strap or belt, it may not be allowed to get in among the machinery.

WILKINSON, WILLIAM, of Nottingham, framework knitter. *Improvements in the method of and machinery for manufacturing ropes and cords.* Application dated April 17, 1854. (No. 882.)

This invention mainly consists in surrounding several wires, previously twisted together, with fibrous substance; and in twisting over this fibrous substance other wires, repeating the process as often as is necessary to complete the size of the rope.

SMITH, JAMES ALEXANDER, of Edinburgh, Mid Lothian, gentleman. *Improvements in the manufacture of explosive projectiles.* Application dated April 17, 1854. (No. 885.)

This invention relates "to the manufacture (by casting, pressure, turning, or otherwise) and application of cylindro-conoidal detonating shells for use as war projectiles, and for other purposes where explosive missiles of such a nature are advantageously applicable."

MEASON, CHARLES, of Warrington, Lancaster, engineer. *Improvements in supplying fuel and water to locomotive engines, or to the tenders of locomotive engines.* Application dated April 18, 1854. (No. 889.)

This invention relates to arrangements in which are employed subterranean vaults for storing the fuel, and certain coking cranes, by which the fuel is raised at once into the tender, these cranes being worked by hydraulic power, derived from a water source, which also supplies a water pillar, which the inventor describes.

POOLE, MOSES, of the Avenue-road, Regent's-park, Middlesex. *Improvements in drying and weighing fibrous and other substances.* (A communication.) Application dated April 19, 1854. (No. 899.)

Currents of dry and heated air are caused to pass into and through a chamber containing the fibres or substances to be dried; and whilst the interior of the chamber is hot, and the matters still within it, the dry weight is ascertained by a weighing machine.

## PROVISIONAL PROTECTIONS.

*Dated August 30, 1854.*

1899. Louis Pierre Lehugeur, mechanic, and Michel Uttinger, gentleman, both of St. Denis, near Paris, France. Improvements applicable to machinery for printing fabrics.

*Dated September 8, 1854.*

1960. Tony Petitjean, of Upper John-street, Fitzroy-square, Middlesex. An improved process for recutting or reforming the faces of files.

*Dated September 26, 1854.*

2072. Thomas Griffiths, of Madeley, Shropshire. An improved pump for raising and forcing water.

*Dated September* 30, 1854.

2097. William Wilkinson, of Nottingham, mechanic. Improvements in looped pile and cut pile fabrics, and in machinery for brushing or raising a cut pile or fleece upon the web on both sides the article, or on one side only, by which means he secures a looped web not liable to let down.

2099. William Tucker, of Old Brompton. Preventing the escape of fuliginous smoke from shafts and flues.

2101. Thomas Collins, of Gayton, Northampton, brick-maker. Improvements in manufacturing bricks and tiles.

2103. Moses Poole, of the Avenue-road, Middlesex. Improvements in condensers. A communication.

*Dated October* 2, 1854.

2105. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in suspended purchases. A communication.

2107. George Wall, of Manchester, Lancaster. Improvements in the manufacture of railway tickets and other similar articles from a substance or material capable of being re-used.

2109. Thomas Sherriff, of Glasgow, Lanark, engineer. Improvements in moulding or shaping metals.

2111. François Durand, of Paris, France, mechanician. Certain improvements in looms for weaving.

2113. Nicholas Bennett, of Furnival's-inn, Holborn, Middlesex, gentleman. A substitute for the scaffolding at present employed in and for the erecting and repairing of buildings. A communication.

2115. Christopher Hill, of Chippenham, Wilts. Improvements in the manufacture of pulp.

*Dated October* 3, 1854.

2117. James Hammond, of Brunswick-street, Blackfriars-road, Surrey, chemist. Holding a book in such a position that it may be read with ease and comfort in an erect, reclining, or completely recumbent position, to be called "Hammond's suspension reading-desk."

2119. William Blythe, of Oswaldtwistle, Lancaster, manufacturing chemist, and Emile Kopp, of Accrington, Lancaster, chemist. Improvements in the manufacture of soda-ash and sulphuric acid.

2121. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in motive-power engines applicable to the working of their valves and to the conversion of the reciprocating motion of such engines into rotary motion. A communication.

2123. William McNaught, of Rochdale, Lancaster, engineer. Improvements in slide valves for steam engines.

2125. Wright Townend, of Harden Bingley, York. An improvement in combing wool and other fibres.

*Dated October* 4, 1854.

2129. Frederick Samson Thomas, of Cornhill, London, and Hooks-villa, Fulham, Middlesex, gentleman. An improved mode of obtaining motive power.

2131. William Peel Gaulton, of Crag Works, near Macclesfield, Chester, mechanical manager. Improvements in breaks applicable to railway carriages and other vehicles.

2133. Aimé Antoine Joseph Legentil, gentleman, of Arras, French empire. Certain improvements in pumps or machinery for raising and forcing water and other fluids.

2135. Thomas Prosser, of New York, United States of America, but now of Birkenhead, Cheshire, merchant and civil engineer. Improvements in the manufacture of certain hollow closed vessels, and in the machinery or apparatus employed therein, parts of which improvements are also applicable when preparing for and fastening tubes into steam boilers, or other vessels requiring tubes to be fixed therein.

2137. Thomas Webster Rammell, of Trafalgar-square, Middlesex. Improvements in steam boiler and other furnaces.

*Dated October* 5, 1854.

2139. Thomas Edwin Moore, of Great Titchfield-street, Marylebone, Middlesex, engineer. Certain improvements in machinery or apparatus for curvilinear and annular cuttings in metals and other hard substances.

2141. Enoch Oldfield Tindall, of Scarborough, York, ironfounder Improvements in mangles and wringing-machines for smoothing and wringing clothes and woven fabrics.

2143. George Collier, of Halifax, York, engineer. Improvements in the manufacture of carpets and other terry fabrics.

2145. Thomas Bennett, of Woodbridge-street, Clerkenwell, Middlesex, gold and silver beater. Improvements in the apparatus employed in the manufacture of gold, silver, and metal leaf.

2147. John Macmillan Dunlop, of Manchester, Lancaster, engineer. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

*Dated October* 6, 1854.

2151. Peter Kerr, of Paisley, Renfrew, thread-manufacturer. Improvements in the treatment and finishing of threads or yarns.

*Dated October* 7, 1854.

2155. George Thomas Selby, of Smethwick, Stafford, manufacturer. An improvement in furnaces.

2157. Thomas Roberts and John Dale, of Manchester, Lancaster, manufacturing chemists. Improvements in obtaining and treating extracts from certain dye-woods, and in apparatus for obtaining such extracts.

2159. Robert Maynard, of Whittlesford, Cambridge, agricultural machinist. Improvements in machinery for threshing and dressing grain.

*Dated October* 9, 1854.

2161. James Shanks, of St. Helen's, Lancaster, manufacturing chemist. An improved mode of manufacturing sulphuric acid. A communication from Robert Von Seckendorf, of Gera, Reuss, Germany.

*Dated October* 10, 1854.

2163. Noel Prothéry, of Lyons, France. Improvements in machinery for making lace.

2165. Valentine William Hammerich, of Altona, Holstein, but now at John-street, Minories, London, upholsterer. An improved construction of buoyant mattress.

2169. John Kershaw, of Brixton, Surrey, engineer. Improvements in the manufacture of wrought iron railway wheels.

2171. William Chubb, of Clifton, Gloucester, gentleman. Improvements in the construction of beams and parts of ships, ships' masts and spars, and other like structures.

*Dated October* 16, 1854.

2208. John Bonnall, of Spittlegate, Grantham, Lincoln, engineer. Improvements in apparatus for holding oil for lubricating purposes.

2210. Etienne Bernot, of Paris, France, gentleman. A new machine for cutting files, which he calls "Bernot's file-cutting-machine."

2212. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. An improved apparatus for discovering the leakage or escape of gas. A communication from Etienne Abram Maccaud, of Paris, France, gentleman.

2214. Lionel John Wetherell, of Compton-street, Clerkenwell, Middlesex, civil engineer, and Augustus Johann Hoffstaedt, of Albion-place, Surrey, agent. An improved construction of pump.

*Dated October* 17, 1854.

2218. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. An improved apparatus for amalgamating the gold and silver contained in pulverized ores.

2220. Arthur Veal, of Oxford, bootmaker. Improvements in the manufacture of boots.

2222. Jacob Dockray, of Leeds. York, machine-maker, and John Dawson, of Holbeck, Leeds, machine-maker. Certain improvements in machinery for raising woollen cloth.

2224. Richard Green, of Sydney-street, Brompton, Middlesex. Improvements in propelling vessels.

*Dated October* 18, 1854.

2226. Auguste Edouard Loradoux Bellford, of Castle-street, London. Certain improvements in breech-loading fire-arms. A communication.

2228. Ernst Gessner, of Aue, near Schneeberg, Saxony. Improvements in gig-mills.

2230. John Mason, of Rochdale, Lancaster, machinist, and William Robertson, of the same place, machinist. Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances, part of which improvements is also applicable for shifting straps, by which motion is communicated in other machines.

2232. Mark Wheeler, of Newton-street, Holborn, Middlesex, japanner. An improved mode of consuming smoke arising from the combustion of fuel in furnaces.

*Dated October* 19, 1854.

2234. Robert Walter Winfield, of Birmingham, Warwick, merchant and manufacturer. An improvement or improvements in tubes and rods used in the construction of articles of metallic furniture.

2238. John Platt, of Oldham, Lancaster, mechanical engineer. Improvements in machinery or apparatus for making bricks.

2240. Thomas Higgins, of Liverpool, Lancaster, commander, Royal Navy. Improved apparatus applicable to the ventilation of ships and mines and other useful purposes.

*Dated October* 20, 1854.

2242. Louis Auguste Chenu, baker, and François Frederic Pillias, contractor, of Fontainebleau, French empire. Certain improvements in preserving animal substances.

*Dated October* 21, 1854.

2246. William Joseph Smith, of Stretford, Lancaster, salesman. A certain improvement in buttons.

2248. John Jamieson, of Oldham, Lancaster, engineer and millwright. Certain improvements in steam engines.

2250. Bennett Johns Heywood, of Green Mount Cottage, Dalkey, near Dublin, Ireland, gentleman. Improved apparatus for affixing postage and other stamps to envelopes, letters, and other documents.

*Dated October* 23, 1854.

2252. Edward Abell, of Lambeth, Surrey, gentleman. An improved instrument to assist the hand in writing.

2254. George Savage, of Adderbury, Oxford, horse-breaker and clipper. A new or improved singeing lamp.

2258. John Penn, of Greenwich, engineer. Improvements in the manufacture of the pistons, slide-valves, and stuffing-boxes of steam engines.

2260. Edme Hyppolite Marié, professor of physics, at Paris, French empire. Certain improvements in the machinery for preparing, spinning, and twisting cotton, silk, flax, wool, and other fibrous substances.

*Dated October* 24, 1854.

2262. François Jean Bouwens, of Mechlin, Belgium, architect. An improved rotary engine.

2266. Joseph Hopkinson the younger, of Huddersfield, York, engineer. Improvements in steam engine boilers and safety-valves, and in apparatus for indicating the vacuum in steam-engine condensers, in relation to the existing atmospheric pressure.

*Dated October* 25, 1854.

2268. John Rickhuss, of Worcester, China potter, and Charles Toft, of St. John, Bedwardine, Worcester, modeller. Improvements in the manufacture of Parian, porcelain China, and earthenware.

2270. William Henderson, of Cannon-street, London, manufacturing chemist. Improvements in treating certain ores and alloys, and in obtaining products therefrom.

2272. Richard Roberts, of Manchester, engineer. Improvements in machinery for preparing and spinning cotton and other fibrous substances.

2274. Richard Hugh Hughes, of Hatton garden. Improvements in transmitting motive power.

2276. François Lambert, chemist, of Rue d'Enfer, Paris. Improvements in compounds to be used as cosmetics.

2278. Louis Vital Helin, of Rue des Douze, Apotres, Brussels, Belgium, chemist. Improvements in the manufacture of paper from straw.

*Dated October* 26, 1854.

2280. William Grindley Craig, of Gorton, near Manchester, Lancaster, engineer. Improvements in the mode or method of consuming smoke, and in the machinery or apparatus employed therein.

2282. John Healey, engineer, and John Foster and John Lowe, spindle-makers, all of Bolton-le-Moors, Lancaster. Improvements in machinery to be used for drawing, moulding, forming, and forging articles in metal.

2284. Charles Henry Olivier, of Finsbury-square, London, commission-merchant. An improved apparatus for drying. A communication.

2286. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in transferring coloured pictures, portraits, and engravings. A communication from Leopold Muller and Antoine Widl, of Vienna, Austria.

2288. John Dudgeon, of 151, Fenchurch-street, in the city of London. An improvement in rendering ships and batteries shot proof.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2312. James Cooper Hall, of Monkwearmouth, Durham, ship-owner. An improved windlass. October 31, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November 7th,* 1854.)

1421. James Brunlees. Improvements in drawbridges applicable to rail and other roadways.

1422. Henry Sutherland Edwards. Improvements in preparing textile fabrics or materials for the purpose of their better retaining colours applied to them. A communication.

1429. Thomas Markland. Certain improvements in machinery or apparatus for warping, dressing, and weaving textile materials.
1442. Joseph Hulme. Improvements in steam engines and in valves, parts of which improvements are applicable for diminishing friction in other engines.
1450. Peter Armand Lecomte de Fontainemoreau. Improvements in stopping bottles, and in drawing off aërated or other liquids contained therein. A communication.
1456. Urbain Chauveau and Charles d'Epinois. Improved means or apparatus for preventing collisions on railways.
1468. Henry Heycock. Certain improvements in hydraulic presses employed for packing or pressing cotton, silk, flax, wool, or other fibrous materials.
1469. David Bowlas. Certain improvements in machinery or apparatus for knitting or manufacturing healds or harness used in looms for weaving.
1472. Louis Joseph Cheval. Improvements in beer-engines.
1483. Peter Armand Lecomte de Fontainemoreau. Certain improvements in apparatus for breaking in horses. A communication.
1493. William Lacey. A new or improved method of making copper rollers, cylinders and tubes.
1500. Henry Richard Cottam. Improvements in horse-mangers.
1502. William Robinson and Robert Crighton. Improvements in machinery or apparatus for rolling metals into suitable shapes or forms.
1503. Lorenzo Tindall. Improvements in bruising or reducing grain and other substances.
1519. Victor Gustave Abel Cuvier. An improved apparatus having for object the combustion of fuel and the utilization of the gaseous products for heating and other useful metallurgic purposes.
1526. John Knowelden. Improvements in steam boiler and other furnaces.
1553. Jean Baptiste Dechanet and Antoine Dominique Sisco. Certain improvements in the construction of railway carriages.
1567. George North. An improved apparatus to be attached to garments for protecting watches, purses, and other articles from being stolen from the person.
1587. William Ball. Improvements in drills.
1603. John Thomas Moss. Improvements applicable to apparatus for roasting meat and other edible substances.
1663. Adam Guild and John Pendlebury. Improvements in apparatus for scouring or bleaching.
1665. Richard Johnson. Improvements in coating and insulating wire.
1714. Charles Weightman Harrison. Improvements in obtaining and applying electric currents, and in the treatment of certain products derived in obtaining the same, part or parts of which improvements is or are applicable to the production of motive power.
1788. William Burgess. An improvement in or addition to reaping and mowing-machines.
1798. Charles Blake. An improvement in or addition to doors and door and window-frames.
1920. Nicholas Callan. Improvements in certain galvanic batteries.
2051. Pietro Feloj. Improvements in the manufacture or construction of a knife and fork.
2103. Moses Poole. Improvements in condensers. A communication.
2109. Thomas Sherriff. Improvements in moulding or shaping metals.
2117. James Hammond. Holding a book in such a position that it may be read with ease and comfort in an erect, reclining, or completely recumbent position, to be called "Hammond's suspension reading-desk."
2119. William Blythe and Emile Kopp. Improvements in the manufacture of soda ash and sulphuric acid.
2135. Thomas Prosser. Improvements in the manufacture of certain hollow closed vessels, and in the machinery or apparatus employed therein, parts of which improvements are also applicable when preparing for and fastening tubes into steam boilers or other vessels requiring tubes to be fixed therein.
2137. Thomas Webster Rammell. Improvements in steam boiler and other furnaces.
2143. George Collier. Improvements in the manufacture of carpets and other terry fabrics.
2159. Robert Maynard. Improvements in machinery for threshing and dressing grain.
2161. James Shanks. An improved mode of manufacturing sulphuric acid. A communication from Robert Von Seckendorf, of Gera, Reuss, Germany.
2162. William Crosskill. Improvements in the construction of portable railways.
2208. John Bonnall. Improvements in apparatus for holding oil for lubricating purposes.
2228. Ernst Gessner. Improvements in gig-mills.
2272. Richard Roberts. Improvements in machinery for preparing and spinning cotton and other fibrous substances.
2276. François Lambert. Improvements in compounds to be used as cosmetics.
2312. James Cooper Hall. An improved windlass.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed November* 3, 1854.

1018. Henry Gregory Drewe.
1023. John Hartley Higginbottom.
1024. Julian Bernard.
1032. Charles Benjamin Normand.
1042. Rees Reece.
1078. Henry Young Darracott Scott.
1080. Louis François Saugrin.
1106. Thomas Chambers Hine.
1604. John Knight and James Stubbs.
1628. Hugues Champonnois and Jean Baptiste Bavelier.
1760. John Gibson.

*Sealed November* 7, 1854.

1046. Joseph Shepherd.
1050. John Cundy.
1058. Christopher Nugent Nixon.
1059. Daniell Campbell and James Barlow.
1073. Jérome André Drieu.
1092. James Philip Baker.
1096. Henry Cornforth.
1098. Alfred Vincent Newton.
1118. Johann Haberhauffe.
1120. Peter Armand Lecomte de Fontainemoreau.
1130. John Crossley and Wm. Crossley.
1183. Berkeley William Fase.

1134. William England.
1146. William White.
1149. Joseph Kuczynski.
1404. Alexander Bain.
1436. Nathan Thompson, junior.
1558. Thomas Wright.
1561. William Hunt.
1590. John Sudbury and Samuel Wright.
1685. Henry Green.
1703. Paul Garavaglia de Soresina.
1769. Joseph Moore, Samuel Beswick, and Benjamin Wilson.
1817. Edward Lund.
1819. William Johnson.
1820. William Johnson.
1832. Robert Brisco and Peter Swires Horsman.
1870. George Wall.
1896. William Campion.
1929. John Lockhart White, Henry Henderson, and James Cowper, sen.
1937. William Brownfoot.
1971. John Wesley Hackworth.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

The communications of Mr. W. Woodcock, on the Smoke Question, and Dr. Kemp, on Electro-magnetism, are, with several others, unavoidably delayed.

*Sebastopol* writes from Hereford as follows:—"Sir,—As a reader of your Magazine, I much regret you should have suppressed "Alma's" proposition for firing rockets without sticks, &c., as he solicits remarks from others which ought to have been suppressed also, if you did not intend publishing the whole of his correspondence; as, in my opinion, that portion is omitted which was most likely to call for a remark. Trusting that your next publication will furnish the remainder of his letter, I am, Sir, &c."

We regret to find that our correspondent thinks it necessary to complain of our refusal to insert the whole of "Alma's" communication. It must, however, be remembered that, if the principle of construction adopted by "Alma" be an improper one, as we believe it is, descriptions of his rockets could be of but little service to anyone. We recommend "Sebastopol" to examine "Dejere's" letter, which appears in a former part of this number.

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

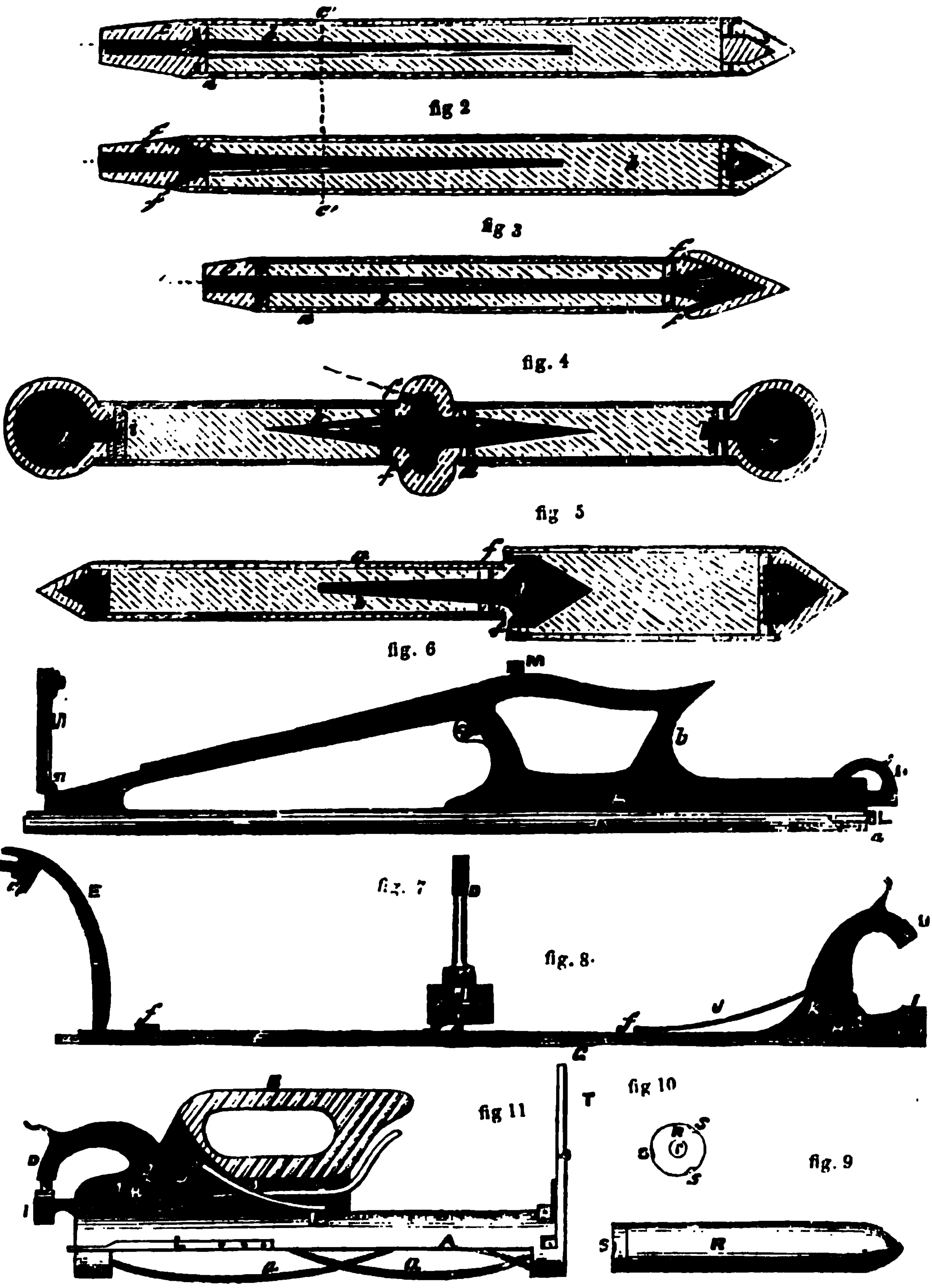
# Mechanics' Magazine.

No. 1632.] SATURDAY, NOVEMBER 18, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## HALE'S ROCKETS AND ROCKET-MUSKETS.

Fig. I.



## HALE'S ROCKETS AND ROCKET-MUSKETS.

(Patent dated January 11, 1844, and April 19, 1853.)

In the present temper of the country, an exact description of the improvements that have been made in the construction and use of war-rockets, by Mr. Hale, the well-known rocket-manufacturer, will doubtless be acceptable to our readers; especially as some, at least, of these improvements are demonstrating their efficiency in the military operations now progressing in the East. We shall adopt Mr. Hale's own description of his arrangements, in order that we may conveniently introduce his testimony upon several points recently discussed in our pages.

Fig. 1 of the engravings on the preceding page represents a section of a rocket constructed according to one part of Mr. Hale's invention. "This rocket," says the inventor, "is caused to move with a considerable degree of correctness, without tumbling over during its flight, by being loaded at the hinder part, and having a hole through the loaded end, bored or formed in the line of the rocket's axis, which is the cause of keeping the rocket correct in its movement. *a a* is the metal case of the rocket, which I prefer to line with a thin interior surface of wood, or it may be of other suitable material, in order to separate the charge of pyrotechnic matter, *b b*, from the iron. *c* is a cast-iron plug or weight fixed at the back or hinder end of the rocket. This weight is to be such as to bring the centre of gravity towards that end of the rocket; and I have found, so far as my experiments have gone, that the weight should be such as to balance the head and solid part of the composition, and which brings the centre of gravity to a position within one-third of the length of the case containing the pyrotechnic matter, so that in the rocket shown the centre of gravity would be at or about the dotted line, *c′ c′*, and the centre of gravity of the rocket will come nearer and nearer to the head of the rocket, as the matter contained therein is consumed; and it will be found that by thus weighting the back end of a rocket, combined with the making a hole in the direction of the axis of the rocket through the metal of the weighted end, as is shown, that a rocket so made will perform with considerable correctness. In filling the case, *a a*, I cause there to be a hollow portion, *d*, left in the axis of the rocket, either by placing a core therein when filling; or else, when filled, I cause the hollow to be produced by boring out the pyrotechnic matter, as shown at *d*. *e* is the upper or fore end of the rocket, which I make of cast iron, and fill the hollow with wood, or this end may be suitably formed for a shell."

Mr. Hale then proceeds to say, "I have thus described a rocket of the simplest form, showing how the use of a stick or rod may be dispensed with. I will now proceed to describe another of my improvements on rockets, by which a rocket can be made to rotate around its longitudinal axis, and thus enable the elastic force which drives it onwards to move it more correctly, as any bias which a rocket may have consequent on a difference of weight in a particular locality or irregularity of form, will be compensated for by a constant rotation about its axis in its flight; and this improvement consists in forming side or lateral openings in such manner that the ignited matter rushing through these openings will cause the rocket constantly to revolve." Fig. 2 shows a section of a rocket constructed according to this part of the invention, the parts being marked with the same letters of reference as in the preceding fig. "*f f* are oblique openings, inclining downwards; and I prefer that these openings should be formed tangential to the circle of the interior cavity of the rocket; hence, when the ignited matter is rushing out of the openings, *f*, the rocket will be caused to rotate." Fig. 3 shows a section of another arrangement of rocket, having the openings, *f* (for producing the desired rotation of the rocket), at the upper or fore end, as is shown. In other respects the rockets shown at figs. 2 and 3 are similar to that shown at fig. 1, they being weighted at the hinder or lower end by the metal, *c*, with a hole through it in the line of the axis of the rocket. Fig. 4 shows a section of another arrangement of rocket, so constructed that the charge of pyrotechnic matter is burning in two opposite directions, the discharging openings, *f f*, being intermediate of the length. "This rocket is formed for carrying two shells, *g*, *h*, one at either end, with an opening into each at *i i*, to ignite the bursting powder in the shells. *j* is a chamber, which connects the two parts, *a a*, of the rocket, the pyrotechnic charge in each being hollow at *d d*, as is shown; hence the matter in both compartments, *a a*, will be simultaneously consumed, and the ignited products will rush into the chamber, *j*, and thence through the openings, *f*, by which the rocket will continue to be propelled forward, and will rotate about its longitudinal axis." Fig. 5 shows a section of another construction of rocket, somewhat similar to the preceding, but having only one shell at the upper end, the matter in the parts, *a a*, burning simultaneously, and the ignited products rush out at the openings, *f*; but in this

case the chamber, *j*, is somewhat differently formed, as will readily be understood on examining the engraving. "I would remark," says Mr. Hale, "that before filling either of the above rockets, I line the same with a thin veneer of wood or other suitable material, for separating the iron of the case from the charge, thereby preventing any chemical action from the iron injuring the pyrotechnic matter." *

Fig. 6 is an elevation or side view of one of Mr. Hale's new kinds of fire-arms, which he terms a "Haleon musket." A is a plain barrel or tube open at both ends, and of a diameter sufficient for the body intended to be fired freely to pass through. B is the stock, which is shaped so that when the curved part, *b*, is placed against the shoulder of the person using it, the barrel will lie under his arm, and at a considerable distance below his face and shoulder, and the end, *a*, of the barrel will pass beyond him, by which arrangement the back-fire or flame from the rocket is prevented from striking the face or injuring the person who fires it. C is the trigger, and D is the cock or hammer of the lock for firing the rocket. These parts are shown detached and on a larger scale in fig. 7, which is a side view partly in section, and in fig. 8, which is an end view of the same. When the trigger, C, is pulled, it raises the upper end of the lever, E, which is inclosed within the stock and turns upon a pin, *e*. The lower end of the lever, E, is forked, and enters a notch on each side of the rod, F, which slides in guides, *f f*, fixed to the plate, G. The other end of the rod, F, is connected in a similar manner to the lever or sear, H, which turns upon a pin, *h*, and enters a notch in the cock or hammer, D, which turns upon the pin, *d*, and falls upon the nipple, I. J is the main spring, fixed at one end to the guide, *f*, and connected at the other end by a link, K, to the cock, D. The cock, D, is raised by hand to the position shown in fig. 7, and the sear, H, is pressed into its notch by the spring, *i*. A percussion cap is placed on the nipple, I, and on pulling the trigger, C, the cock or hammer, D, is released, and falls upon the percussion cap. The nipple, I, and the supports for the pin, *d*, of the cock are fixed upon the plate, G, which is itself fixed to the stock, and serves to support the barrel.

Fig. 9 is a side view, and fig. 10 is an end view of a rocket suitable for being fired from the Haleon musket. This rocket has no stick, and is constructed as described above, consisting of a hollow tube of iron, R, or other suitable material, having a central aperture, *r*, at one end, surrounded by three diagonal or tangential apertures, *s s s*; the other end of the rocket is closed by a solid or hollow head. The rocket is loaded with rocket composition, as is well understood. The fire issues from the central aperture, and also from the three diagonal or tangential apertures, which cause it to revolve upon its axis like a rifle bullet when fired. The direction of its motion is thus preserved, and no stick is required. This rocket is slipped into the end, *a*, of the barrel of the musket, fig. 6; and one end of a short piece of quick match is inserted into its central or one of its tangential apertures, while the other end is inserted into the lower opening of the nipple, I. The musket is cocked, and a percussion cap placed on the nipple, and it is then presented and fired at the mark or object to be hit. The rocket flies through the barrel, A, which gives it the proper direction. In order to keep the rocket in its proper position when the musket is being moved or inclined from a horizontal position, a spring, L, is fixed at each side of the barrel, A, so as to grip the rocket with sufficient force to hold it until it is fired. M is a sight fixed on the stock, B; and N is another sight hinged to the stock at *n*, so that it may be folded down upon the stock when not in use. This sight, N, has a sliding-piece, *p*, with a small ball or knob, which is made to cover the mark when the eye is applied to the sight, M. The sliding-piece, *p*, is adjusted according to the distance of the mark or object to be hit, and the range of the rockets employed; and it is placed lower when the object is at a considerable distance than when it is near. The sight, M, is capable of a slight motion in a direction transverse to the barrel, so that it may be adjusted to allow for the action of a side wind upon the rocket. The barrel, A, may be cylindrical, or its lower part may be of an angular form, as shown in the section. The angular form is adapted for firing rockets of different diameters, as shown by the dotted circles.

Fig. 11 is a side view of another of the improved fire-arms, which is termed a "Haleon pistol." A is the barrel, which is open on the lower side, and contains three twisted or helical wires, Q Q Q, which serve to support and guide the rocket, instead of a complete tube, as shown in fig. 6. These wires, Q, have also a tendency to cause the rocket to rotate upon its axis, or to facilitate the rotation communicated by its diagonal or tangential fire. They may be inserted in the barrel of the musket, if desired. B is the stock or handle, which is shown in section. D is the cock turning on the pin, *d*, and provided with a main spring, J, and link, K, as in the lock of the musket. H is the sear turning upon a

* These rockets may be lighted by a quick match, and may be fired or discharged from a trough or tube, in the ordinary manner.

pin, *h*, and having a long tail, C, which acts as the trigger. I is the nipple, and *i* is the sear spring. L is one of the springs for holding the rocket in its place while it is being fired. T is a shield to protect the hand from the fire of the rocket. The rocket is placed in the pistol and fired, as before described; but the pistol is held at the side of the person who fires it, instead of in front, so that the back fire of the rocket may not strike against him. A cylindrical barrel, or an angular barrel may be substituted for that shown in fig. 11.

In lieu of conveying the fire of the percussion cap to the rocket, by means of a piece of quick match, it may be conveyed through a small curved metal tube, which may turn upon a joint, so as to shift out of the way while the rocket is slipped into the tube. The construction of the lock may also be varied at pleasure. For example, the hammer may be a plain rod impelled by a spiral main spring, and sliding in a direction parallel to the barrel, and striking upon a nipple placed in a similar position.

## PATENT CASES IN EQUITY.

### NO. I.

### ORIGINAL INVENTION OF GREASE-TIGHT RAILWAY AXLE-BOXES.

(*Concluded from page* 461.)

It appears, therefore, that Richard Wrighton forestalled Normanville in the application of elastic India-rubber to stop the leak at the back of axle-boxes and retain the grease; and so far as that goes Normanville's patent is but wasted parchment, which cannot be valid till the offending India-rubber is removed from it by disclaimer, and that must be equivalent to disclaiming the whole patent. So Mr. Wrighton is at the head of grease-tight axle-boxes, and it will be seen that the claim of Vigurs to feed at the sides, instead of the crown of the boxes, is forestalled by Wrighton.

But, going further back, we find that in May, 1847, six months prior to Wrighton, and twelve months prior to Normanville, Adams and Richardson obtained a patent for, amongst other things, an improved axle and axle-box, of which the following is the specification:

"And for the purpose of lubricating the axles of railway wheels more efficiently, we make the bearings or journals in separate parts to put on or remove when required; and we make the axle-box a circular or oval cutting in one piece, or it may be wrought-metal."** A conical spring steel or metal hoop is applied, with one edge to the back part of the axle-box, at the end next the wheel, and the other edge of the hoop is made to press on the axle, in order to hold the grease or oil ** *Or, instead of this hoop of steel, the axle-box may be projected over the axle, and an elastic stuffing applied, which will preserve oil or grease at a sufficient height to keep the lower side of the axle lubricated without waste; or a pipe of leather or gutta percha may be applied to effect the same object.*"

"*Claim.*—Also the modes of constructing bearings and axle-boxes for railway wheels, so as to replace the bearings when worn, such bearings being fitted to axle-boxes, provided with spring-metal rollers, or conical hoops, or other flexible material, to retain the grease or oil and prevent waste, as hereinbefore described."

It appears by this specification that the object of the patentees was to enclose the back of the box, so as to prevent the grease or oil from running away either by a metallic closing or by a stuffing-box, or by gutta percha or leather, or other flexible material; and it is curious that the universal material, vulcanised India-rubber, is not mentioned, unless included in the term "flexible material;" and it would appear that the patentees were aware of its unfitness for the purpose. It is clearly intended to keep the lower side of the axle in a bath of grease or oil, and to make the arrangement for retaining it a flexible material, to counteract the up and down and end wear. The words, "The box may be projected over the axle, and an elastic stuffing applied," exactly fit the casting of Vigurs' box, which is "projected over the axle," and has a groove perfectly adapted to receive the elastic stuffing. Thus, a pipe or collar of leather or metal, pressed gently upwards by a spring; or the conical spring hoop applied to this projection and stuffed with cotton waste, would form a most complete elastic stuffing, answering to India-rubber without its dissolving qualities. The contraction of the spring will always keep the cotton close to the arm, and the cone form will always tend to force the cotton waste against the back of the box, and thus keep a close joint. It would appear that this is the cheapest and most durable arrangement, and that the subsequent "improvements" are a work of retrogression.

Searching still further back in the list, we find in November, 1846, a patent in the name of Adams for "Certain improvements in the construction of wheel carriages and engines," containing axle-boxes amongst other things, the specification of which runs as follows:*

"Another part of my improvements relates to the construction of axle-boxes for railway carriages, to diminish the effect of lateral shocks which may result from the occasional rubbing of the wheel-flanges against the rails, and also to diminish the wearing away of the axle-bearings endways by friction at the shoulders of the axles from the same cause. The axle-box being, as usual, with a vacant space at the end of the axle-box opposite to the extreme end of the revolving axle, that space being about half an inch or more, I insert therein a piece of hard wood, or metal, or leather, or other suitable substance, to be opposite to and in contact with the whole surface of the opposite end of the revolving axle for affording an endway bearing thereto, instead of depending on the shoulder of the axle for such endway bearing. See fig. 25, sheet 11, which is a horizontal section, and fig. 26 a transverse section of one end of an axle and the box; therefore A, being the bearing part of the axle, and B the bearing part of the box; C, fig. 25, is the said substance which I apply as aforesaid opposite to the extreme end of the revolving axle, A, to form the endway bearing thereupon; and that end of the axle, and the corresponding surface of C, must be kept well greased or oiled. The usual shoulder of the axle is not to form the end bearing."

*Claim.*—The improvement, hereinbefore described, represented by figs. 25 and 26, for bearing surface at the extreme ends of the revolving axles of railway carriages.

The drawings, show the end bearings in hard wood and a groove for the bottom to slide in, so that the bottom may be easily removed and a fresh end-bearing piece applied. Beyond this we find no traces of railway axle-boxes in the patent list.

It seems therefore that the improvement of Barrans had been foreseen by Adams, as well as the grease-tight principle, and also the wooden bottom to boxes, apparently to prevent jar and vibration.

In the published proceedings of the Institute of Mechanical Engineers, we find the following modifications of Adams's box: "No. 1 shows the pipe or leathern collar with slotted holes arranged to lift the collar when worn. It also shows the end bearing piece and some floating rollers to lift the grease or oil to the axle in case of its being lose. This appears to have been used on the South Eastern Railway and elsewhere. No. 2 shows a box with a flexible pipe collar attached to the back of the axle-box by a flexible steel ring, and by a similar ring to the axle. No. 3 shows the metal hoop with a hollow space in which to apply elastic packing or stuffing."

The axle-boxes adopted for the various lines of East Indian railways, for the purpose of preventing the escape of grease and the entrance of sand in hot and dusty climates, are precisely as described by the specification of Adams, and are adapted for the application either of the leather pipe collar or the metallic hoop with a stuffing inside, the latter being the best, as it was the earliest proposed arrangement, though not adapted for the wheels formerly used in close contact with the axle-boxes.

We have now tracked this matter through, and can only find two general principles arrived at in the several specifications—viz., the closing the opening between the axle and the back of the box to retain grease or oil, by better or worse means; and the prevention of end wear by end bearings against the axle; and it appears, that mechanically considered, this closing of the box can only be efficiently attained by a flexible or elastic material that will alter and resume its position, so as to elude the effects of blows. The question therefore lies in a nutshell—it is simply one of date and priority, and needs no array of gentlemen in gowns and out of gowns to prove that white is black, and black is no colour at all.

Adams and Richardson, in May, 1847, claim closing the back of the axle-box to retain the grease.

Wrighton, in December, 1847, claims closing the back of the axle-box to retain the grease.

Normanville, in May, 1848, claims arrangements for enclosing the lubricator in a vessel which shall retain it and exclude the dirt.

Vigurs, in November, 1851, claims the application of a metal collar at the back of the axle-box to prevent the escape of grease. Subsequently, Barrans shows a mode of closing in the back of the axle-box to retain the grease, but does not claim it.

Again Mansel shows a mode of duplicating Barrans. And, lastly, Hodge representing some one else, shows a mode of retaining grease similar to the plan of Vigurs.

Since then, there are many new aspirants with patented plans for lubricating railway axles.

We will venture to say, that the common

* The extract will be understood without the aid of the drawings referred to.

sense of the first twelve mechanics we might meet on a railway, with the facts simply stated, would decide at once on the equity of the case and prevent waste of time and money. It is not for the interest of the public that injustice should be done; for the black mail exacted from inventors, the public will have to pay for in some shape or other. We trust, that this, our analysis, will widely circulate amongst railway officials and authorities, and enable them practically to decide the question on its merits before any legal trial comes off.

It is a crying grievance that an inventor should be called upon to spend a large sum of money to establish a right in law, which may be re-disputed, so long as his adversary's purse is longer than his own. This wants amending, and meanwhile, we shall do our part to state clearly such patent cases as may come before us; and it would be a very fair and useful exercise of the intellects of members of mechanical and other institutes, as, for example, the Society of Arts, to hold occasional sittings for the prevention of legal quibbling and the furtherance of practical equity. In many cases shame would accomplish that which the course of justice fails to effect by the mere publicity. Such occasions would afford a fair arena for young barristers to win their spurs in the novel process of showing, not special pleading, but equitable acumen, in making truth triumphant, and dragging pettifogging oppression before the bar of public opinion. The Court of Chancery and Doctors Commons are not the only institutions that would benefit by "ventilation."

We have so far dealt with this particular question mechanically and legally, from the documents before us. We may at a future time, devote an article to its secret history, which would be as interesting, after its fashion, as Carlyle's History of the "Diamond Necklace," and probably useful withal. The "Romance of Patents" has yet to be written, and no page in the chapter of human life is more filled with Aladdin's Caves, and Doubting Castles, and Giant Despairs, and Barons of Evil, at bridge ends, lying in wait to levy black mail from unwary passengers; and amongst them, doughty champions and resisters of evil, laying lance in rest only for the right, at their own proper cost and peril; and firm strong hands with a warm gripe that strikes the veins with a healthy electric current, like the rod of Moses the hidden water spring;—boundless wealth, sometimes matched with a noble mind, sometimes with a currish spirit; modest merit and superficial assumption; doers and pretended doers. But out of all grows good; and if the men of real power once will that the evil shall be abated by being held forth to publicity, the rotten meshes will drop to pieces, and people will wonder why they so long endured them.

The Patent Law Reform is yet far from what it should be. There wants yet a national definition of what is *new*. Sixty years' possession is held to give a good title to land. Sixty years' abeyance should be held as an abandonment by the public of its interest in practicalised ideas. "There is nothing new under the sun;" but a patent of revival for a practically lost art would, in many cases, be as advantageous to the community as a patent for a new discovery. The public confer a premium of possession on discoverers, because without it no one would pursue the business of discovery, but would prefer squabbling for and pirating the already discovered. Sixty years' abeyance should confer a claim to rediscovery. Failing this, many old and valuable fields lie fallow, and the pioneers of progress only pursue their searches in the far west of the new. Many of the old inventions failed for want of fitting circumstances and appliances at the time. The circumstances and the appliances being attained, inducements for revival are needed. What so fitting as a fourteen years' lease for reviving the dry bones, for converting the barren waste into a fertile land? The patentee inventor does more than the simple inventor; he calls public attention to a new fact; he forces it upon the public; he excites competition and tenacious rivalry; he stirs up the inert, possibly to excel his own doings, and thus endows the public with a possession which they would not obtain but for the exertions of the acquisitive faculties. The wealth of Manchester and of Leeds has grown out of the stimulus of patents; and we may imagine the beggarly condition to which competition would ultimately reduce profits, if every manufacturer were scared from novelty by the consciousness that all his neighbours were watching his experiments with the intention of using them at free cost, when he might have sunk his capital to obtain a successful result. Reduced profits would induce reduced wages, and strikes, and lockouts, and an ultimate loss of the trade to the community.

## ARE THERE MORE WORLDS THAN ONE?

### NO. III.

HAVING disposed of what we might designate the argument from human consciousness, in the manner already suggested to our readers, we shall not attempt to assail it on the other points where its weakness

could be easily demonstrated. There remains, therefore, but little requiring the expenditure of time and thought; nothing perhaps except a passing reflection or two on the reasoning drawn by our author from geological time. And yet we cannot avoid the importunities of a facetious friend of ours, who, rebuking us for the solemn gravity we have maintained in the exercise of our critical functions, is desirous of following out the analogy according to his own fancy, and deems it applicable to the literary world, a very small fragment, he declares, of the entire humanity we have been considering. For instance; let the sun stand, he says, for the ideal excellence around which the various orbs are revolving, together with their assumed inhabitants, although, as he remarks with a malicious smile, they never seem to approach much nearer that which they declare affords them light, heat, and happiness, but from which they manage to turn, generally speaking, no mean portion of their surface. However, letting these more general points in the comparison pass without a comment, here, he exclaims, is little Mercury, the fast man, fiery hot, and always in a pitiable state of perspiration when engaged eagerly pursuing truth for his own sake. Then glides forth Venus, calm and more gentle in aspect, the man of taste and elegant allusions, who nevertheless so perplexes us by his irregularities, always returning, however, into himself again, that we can scarcely follow him, especially as up to this time no small doubts envelope his domestic arrangements, it never having been clearly ascertained whether he will acknowledge the beautiful satellite which some affirm ought to accompany him in all eccentricities, late at night or early in the morning. And yonder comes Mars, terrible to look at, because so bellicose in constitution that he cannot pass over a fixed star (one of heaven's real dignities, immoveable in the tranquillity of true greatness,) without leaving a slur upon it: this is your irascible son of science, who dreams that priority of claims to discoveries, inventions, &c., must be secured by the furious collisions so discreditable to the literary republic, or, at any rate, so exciting to his organs of combativeness. But what shall we say concerning the smaller bodies, that are pouring themselves in a continuous shower upon our attention? May they not be the wandering spirits that have either lost their reputation, till again avouched for by some profound astronomer, whose countenance they have gained, or that are to form the consituent elements of some School soon to be recognised among us, making up for their want of greatness in the particular, by the associative principle in the general. There can be no hesitation, however, about the next body introducing itself: it is Jupiter, the sluggish and lymphatic, all watery indeed, according to Dr. W., and yet with some show of order in its aquatic tendencies; since the very winds (Dr. Lardner affirms) can only blow across its atmosphere in certain lines of direction. A good symbol this, cries our friend, of your obese encyclopædist or dictionary-maker, who, notwithstanding the incessant labours of the poor hacks that may revolve around him, maintains the even tenor of his way, without a suspicion you could ever think him unnecessary in all the possible cosmical arrangements you may suggest. Then there is that somewhat extraordinary Saturn, in ancient mythology the child eater, and in our tropology the representative of not a few educational institutes, that, being a long way from the sun, set up a constitution of their own, and surrounding themselves with their vested interests and conventionalities, move on in the slow respectability of mediocre attainments. But we will not allow him to push the comparison any further, except to say he believes the Comets may dash across our path, like the so-called men of genius, that, looking all fire and glory, are resolved, after all, into a little misty vapour, consuming themselves by their own brilliancy, to disappear altogether from the world they had astounded; while all around us and above shine out in their own clear lustre, "the real stars of an immortal name," whose parallax humble men can scarcely take at all, but who remain as a continual excitement to look up into the heavens towards which they are pointing, and around some central point in which they are (whatever some Dr. W. might suggest to the contrary) continually revolving.

But let us return from these digressive remarks—too long, and, some will say, perhaps, too discreditable to our position in the world of letters; yet let them reflect that ridicule has been claimed before now as the test of truth, and that humour (a small portion of which, we must hope, is possessed by our laughing friend and philosopher) Coleridge and others have declared to be no mean ingredient in the composition of genius itself. However, we have now put our too roving foot on the solid earth again, being compelled to glance—while mending our pen for the lucubrations of Sir D. B.—at the arguments drawn by Dr. W. from the consideration of geological time, on which, evidently, great stress has been placed by the writers before us, and which, perhaps, is the only novelty in a somewhat wordy discussion. But we are stopped at the very first attempt to master the conditions of the important point we are invited to consider. Are they

settled in any sense between these reasoners? Observe how the case is left with the considerate reader. It is agreed that there has been a progression of life in geological time, it matters not whether flowing by a law of continuous development, emanating from given centres or poles of vital energy (as Professor Forbes would term them*), or illustrating the repeated interference of a divine hand, according to Hugh Miller: it matters not, we say,—our difficulty arises when we take into consideration the appearance of the human creature. See, gentle reader, how we are perplexed by our authorities. Dr. W. has no doubt about the fact that man could not have appeared at all till wanted by the argument; while Sir D. B. would contend that relics of the same man may be some day found even in the Primary strata of the earth; and then, as if to complete our confusion, the American writers are quite sure that Sir D. B.'s anticipations in this particular have been already "realized" in circumstances which they declare indisputable. We are not attempting, be it recollected, to settle the disputes of these inductive philosophers as to matters of fact; yet one thing is certain—that some of them must be endeavouring to palm base coin on us when, under cover of their names, they solicit our acquiescence in their inferences from an argument situated as this really is. Speculation is no very great satisfaction to us while the spade and the hammer have yet to be used, we scarcely know to what extent, and the phenomena they may disclose settled beyond dispute before we dare take one step into the seductive regions of probability. Our authors are even now disputing; we might quietly stand aloof till they can offer the terms on which the reader may pass an unbiassed opinion.

But we do not see much that is satisfactory in this argument of Dr. W., even admitting that he had been warranted to introduce it among the ratiocinations of his book. He says there is a relation between time and space.† "There are intervals so large (in geological time) as to deserve to be compared in their *numerical expression* with the intervals of space which separate the planets and stars from each other," and that, by consequence, if you are satisfied there has been no human life on the former supposition, you should not predicate it concerning the bodies connected with the latter. Now, in the first place, who authorized Dr. W. to reduce down geological intervals to "numerical expressions?" We thought he had talked about them as vague—almost, if not quite indefinable. We commence admirably, assuming, not over modestly, what is to be proved! But supposing you could reduce to arithmetical notation the ages gone by, you possess only a fragment of one part of the comparison; and how can you set down a quantity yet "fluent"—*ad infinitum* it would be, according to some—since, even according to the writer himself, man's history is incomplete, and therefore it must prevent, if we may so say, the summing up of the intervals he is so fond of introducing. In fact, you have nothing that you can state with certainty against the mighty revolutions of the heavenly bodies in the free space around you. That is, you have an unwarranted supposition you imagined you had found among the dead bones of the past, and this you produce with all confidence in reasoning to an alleged condition of the stars about which you really know—just as much, we mean, as founded on well-established, and indisputable astronomical data. This is reasoning from the obscure to the unknowable.

But, generally, is not the whole argument a splendid fallacy? What is time but the measure of space in our own consciousness? So runs the ordinary definition. Admit this, and take what evidently follows. It matters not which body may be assigned as the measure here indicated: the sun or the moon to man, and other bodies to the Jovians or Neptunians, according to Sir D. B. Space, then, is an interval measured in time—we might say by time, and *to us* time is the result of the operation measured into some term of our own existence. Does not the reader perceive our learned author has been using convertible terms for his comparison, and then deducing from this wonderful logical process an argument annihilating all the advocates for the inhabitability of the celestial bodies?

These particulars discussed, there remains very little that should detain us in our further review of the argument, as far as it may be affected by Dr. W. We only repeat what we have before remarked, that Dr. W. begins his strictures on arguments of his adversaries, from the physical facts among which he should have ended his labours. He dwells emphatically on the nature or supposed constitution of certain bodies (the Magellenic clouds, especially); then he transfers his inferences to the tails and nuclei of the comets, and thus reaches those of the fixed stars or nebulous bodies, the shape of which may suit his purpose, and to the motions of which he applies a few general quotations from the *Principia*, or the *Méchanique Celeste*, and then comes down with all the accelerated force of the argument, crushing as he goes, "like a world in ruins," all the conclusions of Sir D. B. and his poor followers.

* *Mech. Mag.*, vol. lxi., p. 146.
† Of a Plurality, &c., p. 164.

Any reader fresh from the books will see in these very few observations we have done our author no injustice whatever. By the process he has adopted, we will undertake to substantiate any dream of an ingenious mind, and, acting like divers disingenuous reasoners quarrelling over another book we could mention, we can convert the facts that lie disclosed on the pages of the volume of Nature into anything we may require for the illustration of our own cleverness, or the upholding of the sects into which philosophers have delighted to divide themselves from time immemorial.

But we have had enough of what, we feel, we ought not to expect from "a Master in Israel," remarkable for his grasp of recorded observations, although not so competent, as will have been seen, to generalize the stores he may have laboriously collected from the various walks of science. In a word, we have gained but little satisfaction from his more abstract reasonings, and we are afraid the world will be injured if the young and thoughtless should follow him in the application of facts. We honestly wish he had not given his book to the world at all!

The negative in its widest terms, then, cannot be reached in following the guidance of the author we have just abandoned. We are, therefore, thrown back on the probability already noticed, that the world—by which we mean the Universe—is occupied or pervaded by intelligent beings—a probability that has forced itself, indeed, as a matter for speculation on almost every observer of the heavens, even, according to Sir D. B., from the times of the Hebrew poet. Not waiting, however, to decide on the last allusion to so early times, which we hold very questionable in an exegetical point of view, let our reader permit us to say, that, while we must condemn all theoretical excursions into the boundless fields before us, unless steadied by the less pretending facts to which the philosopher has sworn a faithful devotion, we must also stand on our guard against the glittering show of Analogy, even should it appear taken from the earth we inhabit and come recommended by indignant remonstrances against the abuse of scientific rules illustrated in the case just considered by us. We have reason to be very timid here.

In the last century a book was written to prove that the sun must be the infernal regions; and so confident was the author of the truth of his discovery, that he estimated the probabilities to which he had given rise in measuring its capacity for the reception of the multitudes he supposed must be at last consigned to its dreadful horrors. A second came forth, not so daring as to mould the orb of day itself into a probability, but attempting to show us, without a smile on his countenance, how the earth, as by itself, grew into life, gave rise to longings that soon became organised results, here darting forth in the neck of a cameleopard, and there condensing themselves in the ponderous foot of an elephant, till at last he could demonstrate how the man grew out of a fish—the dolphin we think,—and so wondrously adapted itself to all the possible circumstances of its life, as to render quite needless the more difficult question, how the quadrumana might have got rid of the caudal appendage, held to be so inelegant in a representative of the genus "homo."* And to-day we have been reading an attempt of a theologian to prove from high analogies, that God must have, by a miracle, converted some of the graminivorous animals into the carniverous tyrants of the forest or plain —because he has read in his Bible, (good man!) that Adam and his beasts were to eat only vegetable food, and Noah could carry with him merely the "provision" he had stored up for this purpose. "And how," asks the divine, "would the second patriarch of the race have been safe in the ark under any other considerations?" † And to crown the whole, a learned man will contend (in our own day!) that the earth is the Hell itself of the Sacred Scriptures; and a very pretty case he can make when crowding together the crimes of selfishness and the dark deeds of oppression and bloodshed. What will come next we know not till the point is determined into what erudite follies a philosopher may run. It may be said, indeed, in defence of some of the singular works alluded to, that the authors of them did not write "Philomathes" after their names or were themselves the active members of almost all the Royal Academies and societies in the civilized world.

First, then, on the present occasion—which means in introducing ourselves to the opponents of Dr. W.—let us see if some of the advocates of the theory supported by Sir D. Brewster do not fall out with their head, and thereby rather strangely narrow the field of research, how much soever they may merit castigation at the hands of Sir D. For illustration, Dr. Lardner yields up the satellites of all the bodies of the solar system, and, wonderful to say, the glorious sun, the very centre of that system itself; nor will he offer a passing thought as to the cosmical arrangements beyond, as if he felt the analogy he had contended for in his previous pages might fail him here. And

* Telliamed, ou entretiens d'un Philosophe Indien &c., Basle, 1749.

† Urania zur Bagrundung und Starkung des Glaubens an Messias, &c. Von J. W. Dieck, Berlin, 1829, p. 55.

really if Sir D. B. will persist in pushing it to its widest extreme, has it never crossed his mind that Dr. W. may be just in demanding the concession that all matter ought to be pervaded by the vital principle; nor would he be inconsistent with himself, for in this manner he could expound the gorgeous phraseology of the Hebrew lyrists, "when the trees of the wood clap their hands, the floods lift up their heads to heaven in adoration and praise, and the hills and mountains skip, as if to meet the feet of Him who rideth upon the winds."

And generally, too, might not the question by hazarded, that if so great stress is to be placed on the analogies thus strenuously advocated by Christian men, it is very remarkable they should have been left in the gross darkness "of the ages," and only permitted just to glimmer upon us now in our day of privileges amidst the disputes of the learned. The presumption would be, we think, on the other side—that the wisdom which placed the celestial bodies in their respective spheres of glory would not induce the opinion that the unaffected admiration of the patriarch Abraham, when gazing up into the firmament, was in any way inferior to the more lucid, though more cold, appreciation of the philosophic observer. Indeed, may we not anticipate the day when the intellect being both better informed and cleared from perilous generalization, the heart of the world shall grow up to every discovery, and carry out its influences much more efficiently, because in a much more child-like spirit, into all the practical engagements of life?

But to return; we shall be disappointed if we proceed to reason on the narrower field of view now presented to us: for, strange to say, as soon as our philosophers leave *terra firma*, and meet with the slightest discrepancy in seeking to transfer their intelligent "creatures" into the loftier abodes provided for them, they begin to talk in phraseology not at all welcome to the ear of Lord Bacon or his disciples. Let us hear them:

Dr. Dick, when alluding to the "rectification" of the theory in reference to the excess of light on the surface of Mercury, exclaims,

"But" (that is, after computations to show the real difference in the terms of the analogy) "we may rest assured, from what we know of the plans of Divine Wisdom, that the eyes of organized intelligencies, both at the extremes and in all the intermediate spaces of the system, are exactly adapted to the sphere they occupy, and the quantity of light they receive from the central luminary." — *Celestial Scenery, &c.*, page 81.

So again as to Uranus: "This quantity of light is equal to what we should have from the combined effulgence of 384 full moons; and, with a slight modification of our visual organs, such a proportion of light would be quite sufficient for all the purposes of vision."—*Ibid.*, page 271.

Turn to Dr. Lardner, who is, after all, by the way, the most cautious, and therefore the most creditable, of these writers:

"If, then" (that is, after presenting diagrams to illustrate the optical law of adaptation), "if, then, the pupils of the eyes on Venus or Mercury were smaller, and those on Mars larger,—in the same proportion as, &c.,—the apparent brightness of the solar light would be the same to all of them."—*Museum of Science, &c.*, part i., page 9.

And then, respecting Sir D. Brewster, who, when speaking of the superior planets, thus expresses himself: "The light of the sun may in these planets be as brilliant, and the temperature of the seasons as genial as they are upon our own earth. An increased degree of sensibility in the nervous membrane of the eye, with an enlarged pupil, may give to light, geometrically feeble (!), a sufficient energy of sensation, while a different condition of their atmospheres may," &c.—*More Worlds, &c.*, chap. iv., page 75. And yet Dick will go on to compute the number of men that might be accommodated in the bodies, the physical conditions of which he disputes at every step; and yet Lardner will write the following in the very Number of his work we have already quoted: "That they are, in fact, the dwellings of beings in all respects, even from their lowest physical wants to their highest social advantages, like ourselves, crowd upon the mind so thickly that we can scarcely give them expression in a clear and intelligible order." And yet Brewster, although every page of his book hints at the same law of accommodation, thus pours forth his excited feelings in almost poetical fervour:

"They must, therefore, have been created for other and nobler ends" (viz., than the arts of terrestrial life!), "to be the abodes of life and intelligence—the colossal temples where their Creator is recognised and worshipped,—the remotest watch-towers of our system, from which his works may be better studied" (at the wrong end of the system again!), and his distant glories more readily descried."—*More Worlds, &c.*, page 80.

Now we cannot too often reiterate, that when philosophers are compelled to employ the Potential Mood in scientific inquiries, they are bound to hesitate, if not to stop in their generalizations, and wait meekly, and it may be for a long time, for the further light they affirm they are so anxious to enjoy. Science is made up of what *is*, gradually piercing its

way, we grant, though by most cautious steps, into the regions beyond the position at present occupied by us, not rebuking, however, a well-balanced theory, or even the suggestion of an inspired poetry, if the one be kept in its proper place, and the other taken as a stimulus to the exertion seeking to resolve our perplexing doubts or remove our almost inevitable uncertainties.

In plain words, it will be seen, then, that when our authors are perplexed by difficulties in the application of their analogy, they fall back on the possibilities of a Divine power They feel they have to modify the retina of the eye (to which alone our references, are confined); the atmosphere for the ear or other senses; the periods of repose brought by the revolutions of the bodies they are considering; the conditions of gravity, &c., &c.; briefly, at every step they must re-define the intelligent creature they patronize, and so conduct us to the certainty—which might have been reached in a much more expeditious mode—that we know, philosophers as we are, just nothing at all on the subject, with that distinctness, we mean, authorizing the extraordinary discussions to be found in Sir D. B.'s book. On the whole, emerging from the confusion in which we have been involved, we cannot tell how eagerly we long for a day, when what we really do know may be succinctly recorded, and perhaps tabulated for use; so that we may be spared the incessant dishonour of the works of the Creator in the misrepresentation put upon them by our public teachers. Meanwhile, we will try to bring together the real conditions of this question, and present them in our next paper, which shall conclude our too extended review.

(*To be continued.*)

## ENGLISH ARTILLERY.

In a communication to the *Journal of the Society of Arts*, Mr. W. B. Adams, says,—"At present a piece of artillery is just what it was at its discovery—a cylindrical tube with a small vent, on which the minimum of art has been bestowed, and which is very rapidly worn out and destroyed in war. We yet need a series of well-digested experiments—first, as to the most perfect form of gun, and next as to its various applications to damage the foemen while sheltering the gunners. It is not to our credit, as a civilised nation at the head of the world's mechanism, that the guns of a mere military empire should throw their metal as far and as accurately as ours—less the skill of the gunners, the more especially if it be true that these guns have been furnished from English foundries, and are not producible in Russia.

## ON THE USE OF HEATED AIR IN FURNACES.

*To the Editor of the Mechanics' Magazine.*

Sir,—I now propose further to consider the statements of Mr. Mansfield, in reference to Mr. Woodcock's furnace, and to the use of hot air. That the unscientific part of the community, and those who will not trouble their heads with scientific details, should adopt the popular and plausible view of a subject involving chemical data, is not to be wondered at. That writers, however, discussing such professionally and chemically, should blindly or intentionally follow in the wake of such popularity is much to be deplored, inasmuch as they thus impede the progress of truth and practical inquiry; confusing where they profess to enlighten, and leading astray where they are looked to as guides.

In matters of chemical and practical detail there is none to which these remarks apply more justly than to the alleged value of hot air in the use of fuel.

The employing hot air was first adopted in the reduction of iron ores; and although the principle on which its merit was supposed to be based ultimately turned out to be erroneous, still the indiscriminate association of the term hot air, with the use of fuel, remained. The absence of all analogy between the melting of iron and the production of steam one would have thought to be a sufficient ground of distinction; nevertheless, the supposed but erroneous value of hot air continues to prevail.

That a less weight of fuel was consumed in the reduction of a given weight of iron, by hot air, was an undoubted fact. It was only, however, when the Scotch chemists investigated the matter, that this reduction in the consumption or weight of fuel used, was discovered to be owing solely to the fact, that a *less weight of air* was introduced. Chemical investigators do not require to be told, that the combustion of a combustible will be effective only in the ratio of the weight of oxygen chemically combined; and further, that the weight of oxygen, in any given volume of air, depends not on that volume, but on its temperature, and consequent state of rarefaction. For instance, that a cubic foot of air at, say 200°, will contain a less weight of oxygen than a cubic foot at 60°. These well-known facts, however, continue to be overlooked by modern hot-air advocates. In truth, one is induced to think that many designedly avoid recognizing them; fearing, that in the absence of the supposed benefit derivable from hot air, the mystery would be at an end, and their occupation gone.

I may here observe, that it is too much the custom for hot-air advocates and

"smoke consuming" patentees, first to adopt the only correct mode of introducing the air—namely, by small films, jets, or divisions, and through perforated bridges and plates; and then to add their own costly apparatus, such as moving bars, self-acting valves, hollow bars or tubes, &c., which have nothing to do with the chemical process of combustion. By these merely mechanical adjuncts, however, they obtain a plausible ground for the high prices charged for their supposed patent rights, keeping out of view the mode of admitting the air, on which the whole merit depends. As a case directly in point, I may here mention that I paid Mr. Prideaux no less than ten pounds for the patent right of a single furnace door, to which his self-acting Venetian blind valves were attached, although the merit of effecting combustion without smoke was owing, exclusively, to the mode of introducing the air in numerous thin films through a series of narrow spaces, and which is the very principle of my own patent furnace. That this was the fact, was proved by finding the good effect increased, when the piston and cylinder and front self-acting valves were held *continually open, or removed altogether.*

On this I may refer to what Charles Dickens says in one of his late "Household Words," when speaking of "Imitation." "A few *thinkers,*" he says, "cut out work for a large body of *doers.* The patentee of a really new and efficient invention sets to work the imitative brains of a small" (? large) "body of inventors, who endeavour to avail themselves of some of the advantages of the first invention by a colourable modification of some of its details." One would almost think these words were written for the occasion, they are so much in point. Here, then, is a just appreciation of one of the weak features of human nature; and to this charge, in the case before us, Messrs. Woodcock, Prideaux, O'Regan, Parker and others, are unquestionably amenable. The same may be said of numerous useful inventions and their *imitators.*

Among the contradictions in which Mr. Mansfield has involved himself, may be stated his extolling the use of hot air at one time, and of cold air at another. In truth, as Mr. Prideaux has done before him, he blows hot and cold at the same breath.

To put the distinction between the states of hot and cold air, as it were, in a physical point of view, the annexed figures will illustrate the effect of expanding it. In these, let the large circles represent the atoms of 10 cubic feet of air, and the smaller ones those of 1 cubic foot of gas; these being the proportions in which alone they combine. In the gas circles, the small black centres represent the carbon, and the two adjoining ones the two atoms of hydrogen (the constituents of carburetted hydrogen gas). Now, let fig. 1 represent the 10 cubic feet of air at the temperature of 60°; fig. 2, the same body and weight, when raised to 300°; and fig. 3, when raised to 540°. In the last case, the volume of air will be doubled; consequently there will be but one-half the weight of oxygen in each cubic foot, compared with what it had when at 60°. The result of this expansion is, that as combustion and the generation of heat is in the exact proportion to the weight of oxygen taken up, the use of the hot air will have diminished by one-half the amount of heat generated from given volumes. Thus, then, we gain no advantage by using hot air, while, by so doubling the bulk, we have rendered it necessary to double the quantity introduced, for the combustion of any given weight of coal or coal gas: in other words, to *double the draught.* Had the hot air been forced into the furnace by an artificial blast (as in the manufacture of iron), this evil might be remediable. Where, however, we have to depend on the mere natural draught, caused by a chimney stack, the result would be injurious as to the quantity of heat generated.

Now, I am unwilling to say that Mr. Mansfield was ignorant of these elementary truths. He may, however, choose on which horn of the dilemma to be impaled. Either he did or he did not know these chemical facts as regards air, its temperature, weight, and volume. If he did not, his opinions of course go for nothing. If he did, then his extolling the use of "highly heated" air, in Mr. Woodcock's furnace arrangements, lays him open to the charge of advocacy at the expense of candour, if not of chemical truth.

Mr. Mansfield observes, "The result of this arrangement (Woodcock's) is, that a current of *highly heated* air which passes through the tubes in the furnace, escapes at the back of the bridge through the perforations in its hinder wall" (or plate, as shown in your late number). "This hot air mixes with the gases from the furnace which holds the smoke in suspension, and there burns it, converting the smoke into flame." In my last I noticed the chemical and physical curiosity of a small volume of gas holding a very large volume of smoke in suspension, and of hot air "converting smoke into flame;" whereas, in the order and operations of nature it is the reverse, flame being produced first, and then, on being cooled, converted into smoke; and without flame, there can be no smoke.

The idea of the gas in a furnace "holding the smoke in suspension" is certainly

Fig. 1.

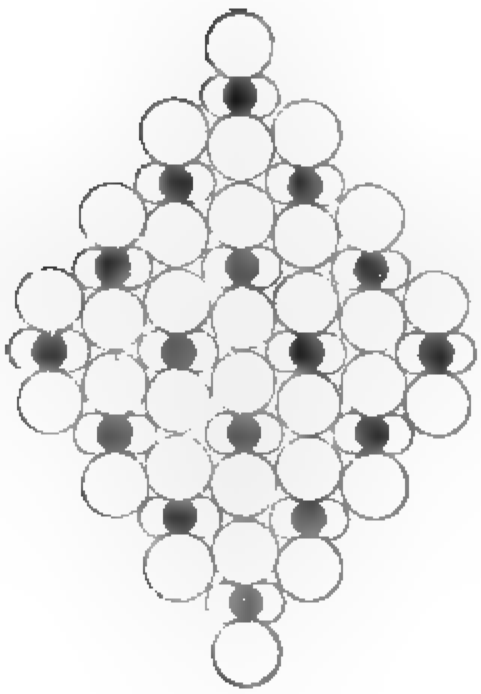


Fig. 2.

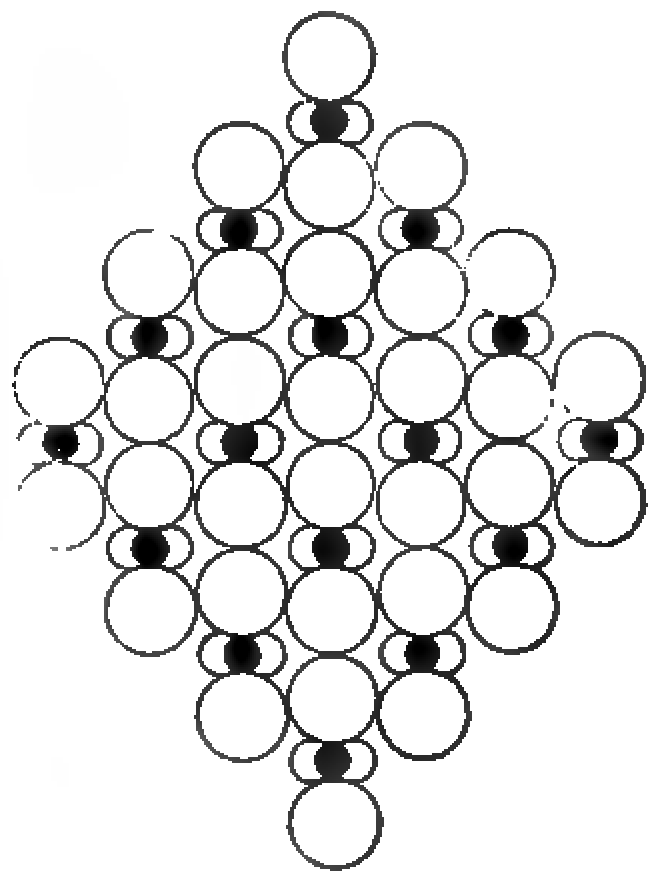
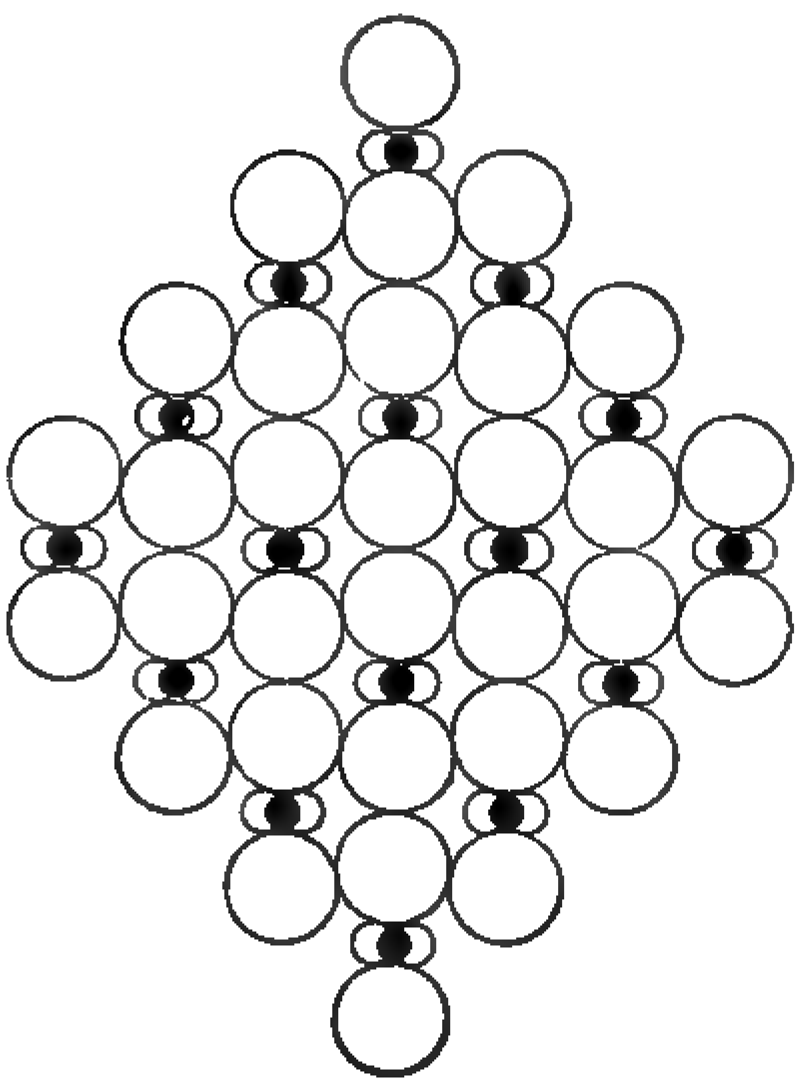


Fig. 3.



original. That smoke, which necessarily must be in large volumes, should hold the small volume of gas in suspension, is possible, and of every hour's experience; but that a cubic foot of gas should hold 10, or perhaps 20 cubic feet of smoke in suspension, can only be explained in the language of the Irishman, who, when asked how he had managed to knock down the half dozen who had attacked him, swore he had "surrounded them."

Again, changing sides, Mr. Mansfield explains, and quite correctly, the value of cold air. "The third consequence," he observes, "is that the air, not being heated, enters the fire *cold*, and therefore not in a *rarefied condition*. By reason of its coldness the air cannot so readily burn the bars, and by reason of its unrarefied state it produces a more intense and rapid combustion of the fuel." Now, the power of effecting a more intense and rapid combustion is just the desideratum we are all in search of. If this be not blowing hot and cold at the same time, Mr. Mansfield will explain the difference.

Having trespassed too much on your space, I must defer, for the present, my remaining comments. I cannot, however, avoid observing, that in a letter signed "Engineer," inserted in your last number, (page 469), the writer has commented, and with great truth and precision, on the several points I have above discussed, and which have almost rendered anything further unnecessary. I am glad, however, to corroborate what has been so lucidly expressed by "Engineer."

I am, Sir, yours, &c.,
C. W. WILLIAMS.

Liverpool, Nov. 13, 1854.

## ON THE FORMATION AND COMBUSTION OF SMOKE.

*To the Editor of the Mechanics' Magazine.*

SIR,—I believe that one proof of the success of an invention, in the shape of a practical result made public, and to which all can resort for demonstration, will outweigh the thousand vague theories and unsupported dogmata now prevailing, and perplexing all, upon the above interesting and important subject. Mr. Mansfield, whose able assistance, given to me before, unasked, I cannot venture again to seek, having abstained from all reply to the three letters, published as answers to his, in your numbers of the 28th October and 4th November, as much, no doubt, from the palpable conclusion, evident to all, that his arguments are not met, much less displaced, by any assertion contained in them, as from his time being absorbed in other scientific enquiries, I may be, perhaps, considered obliged to notice them. I would reply very briefly, and confidently appeal to the perfect results obtained, which fortify my inventions against all mere non-argumentative assertion, by whomsoever made. To the doubting I say, visit and inspect those inventions, in full play at Messrs. Meux's brewery. As to their *novelty*, (which is perhaps rather a legal question), I have reason to be quite as confident. It is not "ex necessitate," that to the thirty years' experience of Mr. Williams success should be granted, or experience would but be a synonym for success, a relation universally disproved. Mr. Williams's work is well known to me; it no doubt contains useful and in parts valuable matter, but his theory, or more properly, hypothesis, precedes and does not follow his induction, inverting the order, and, by a Procrustean process, making facts fit his preconceptions.

Cold air is but a partial, and is not, and cannot be, a total cure for smoke; in other words, it does not cause a combustion of every particle of smoke, so that, while firing and stoking not a vestige of it shall reach the shaft; but this hot air can do, and is doing. The flues in my process, with the air in them, are not heated by the gases, but by the fire itself, and actual and carefully repeated experiments have shown that the heat of this air greatly exceeds the arbitrary limit imposed upon it by Mr. Mushet. This is the sole point in his letter which I need notice: his postscript is answered by Mr. Mansfield's letter in anticipation.

As to the impolite phrase "stumbled upon" used by your anonymous "Engineer" correspondent, I may say, had he examined, before rushing into print to condemn, he would have done wisely. Mr. Nasmyth's and my patents are widely distinguishable, and Mr. Mansfield (whose attainments as a chemist are not unknown in the spheres fittest to appreciate them, videlicet, the College of Chemistry and the Royal Institution,) probably has as great capacity for sound criticism of an invention, as has "Engineer," despite his adverse fiat.

Mr. Williams, inconsistently enough, claims my plan of applying hot air, and refers to his book in proof. Now, throughout that work, he reiterates that he has never used, will not use, and will not advocate the use of aught but cold air, and, in reference to Mr. Mansfield's letter, overlooks the vast difference between supplying cold air to the fuel on the bars and supplying cold air to the gases, after they have left the fuel,—very desirable in the former,

but, as being calculated to reduce the heat of the gases below their "flame points," to be deprecated in the latter case.

Time will not permit my indulging in, and I must henceforth decline, further discussion. I repeat that proof with me and sound practical results surpass all hypothesis and theory.

I am, Sir, yours, &c.,
WILLIAM WOODCOCK.

Earl's-court, Nov. 9, 1854.

## WHEEL-CUTTING.

*To the Editor of the Mechanics' Magazine.*

SIR,—If your correspondent, "A Wheel-Cutter," follows the calculation of Messrs. Webster and Powell, he will not obtain a correct number of teeth, because 49, which they have found for their locking-wheel, is not a divisor of 720. By a little reflection he will have perceived the error; I hope before he set to work.

The locking-weel must be of 48 teeth, as I said in my first letter, since $\frac{720}{48}=15$; by keeping $\frac{1}{48}$ of a turn, or one tooth of the locking-wheel at each tooth cut, we shall have 49 teeth in an entire revolution of the locking-wheel, and $49\times15=735$.

It might be more easily understood if we mark each division of the wheel of 48 by numbers 1, 2, 3, 4, &c.; the first cut being at No. 1; the second, at No. 2; the third, at No. 3, and so on to the 48th cut, which will be at No. 48; and as we have kept $\frac{1}{48}$ of a tooth at each cutting, we have obtained $\frac{48}{48}=1$, which will be the 49th tooth cut when we return to the first position at No. 1 for a second revolution, and so on till we have completed 15 revolutions, equal to one of the plate of the engine.

I am, Sir, yours, &c.,
RENÉ CHERBONNEAU.

London, Nov. 13, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

PFEIFFER, JEAN DANIEL, of Paris, Rue Princesse. *Improvements in bookbinding.* Patent dated April 19, 1854. (No. 898.)

In carrying out this invention, the books to be bound are placed between certain sliding plates, with their front surfaces on blocks, by which they are caused to become concave in front and convex at the back; screws placed at the ends of a movable frame are then caused to set up the ends, and consequently to press the books between the sliding plates, which divide them one from another, &c., &c.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in separating substances of different specific gravities, and in machinery employed therein.* (A communication.) Patent dated April 19, 1854. (No. 905.)

*Claim.*—Effecting the separation of gold or other metals from sand or other similar substances, by causing currents of air to act on the mass in such manner as to cause the particles of which it is composed to arrange themselves in the order of their specific gravities.

VICKERS, THOMAS, of Manchester, Lancaster, bone merchant. *Improvements in the manufacture of manure.* Patent dated April 20, 1854. (No. 906.)

This invention consists in dissolving wool, hair, shoddy, woollen rags, and other waste products of wool and hair, with soda, soda ash, or potash, by means of artificial heat, and in combining the mixture with horn hoofs, pulverised bones, calcined animal charcoal, or other similar substances, for the purposes of manure.

RICHARDSON, ROBERT, of Great George-street, Westminster, Middlesex, civil engineer. *An improved method of joining or securing the joints of pipes.* Patent dated April 20, 1854. (No. 908.)

The inventor proposes to use a mould which shall encircle the ends of both the pipes to be connected together, and to pour the melted iron into it so as to form a ring round the ends to hold them firmly together.

BROWN, HENRY, of Halifax, York, topmaker. *Improvements in combing wool, hair, cotton, and other fibrous materials.* Patent dated April 20, 1854. (No. 910.)

These improvements consist in further cleansing and combing the fibres, by the aid of suitable combs or teeth, after the fibres have been taken in detached quantities and fed into the comb, from which they are drawn off in the form of a sliver. A holding plate is applied to hold them in the teeth of the comb, in order to prevent the further combing or cleansing process from taking away too much of the long fibres.

JONES, GEORGE, of Spring Vale Ironworks, Sedgley, Stafford, ironmaster. *Improvements in landing-apparatus to be used in working mines.* Patent dated April 20, 1854. (No. 912.)

In carrying out this invention, a square frame is erected around the mouth of a pit or shaft, and to it are attached two lids or doors connected by cranks and rods. These parts are put in action by a lever, which may be worked either by hand or by machinery, the motion of the lever causing the lids or doors simultaneously to open or shut, as may be required.

JOHNSON, WILLIAM, of Lincoln's-inn-

fields, Middlesex, civil engineer. *Improvements in machinery or apparatus for making bricks or tiles.* Patent dated April 20, 1854. (No. 913.)

This invention comprises several heads, the chief of which is to be a certain construction and arrangement of compressing pistons, a mode of working or actuating the same, and a mode of removing the compressed bricks or tiles from the moulds by a further movement of the pistons beyond that required for forming them.

ANDERSON, FREDERICK BUONAPARTE, of Gravesend, Kent, optician. *An improvement in spectacles and eye-glasses.* Patent dated April 21, 1854. (No. 916.)

*Claim.*—Constructing the joints of spectacles and double-eyed glasses, and adapting thereto spiral springs, so as to cause the side pieces or temples of spectacles, and the frames of double eye-glasses to fold down when not in use, and to remain upon the head or face when placed there.

HARCOURT, WILLIAM and JOSEPH, of Birmingham, Warwick, brass-founders. *Improvements in chamber or flat-bottom candlesticks.* Patent dated April 21, 1854. (No. 920.)

These improvements consist mainly in the application to chamber candlesticks, made of china or earthenware, of a receptacle for holding matches.

BLAVIER, AIMÉ, of the Chemine-de-fer-de l'Ouest, Boulevard Mont Parnasse, Paris. *Improvements in locomotive engines.* Patent dated April 21, 1854. (No. 923.)

In M. Blavier's engine the steam generating apparatus is separate from the steam reservoir, and the axles of the driving and coupling-wheels are placed above the cylindrical part of the generator, and below the reservoir; the latter being put in communication with the cylindrical part of the boiler through two vertical pipes, and with the space above the fire-box or dome, by means of two horizontal pipes.

BARLOW, HENRY BERNOULLI, of Manchester. *Improvements in manufacturing metal nuts, and in machinery for stamping, forging, and punching the same.* (A communication.) Patent dated April 22, 1854. (No. 924.)

These improvements consist—1. In rolling or forging iron, so that when a piece of the bar of suitable length is cut off a hexagonal blank is obtained, such as is required for making a six-sided nut. And 2. In the manufacture of nuts from a heated bar or plate of metal at a single operation, by cutting from the bar or plate a piece which constitutes the blank, swageing it into shape, and punching the hole through it while it is highly heated.

MOUCHELL, PIERRE JEAN FELIX, manufacturer, of Paris, France. *Certain improvements in melting and in treating the ores and metals.* Patent dated April 22, 1854. (No. 925.)

This invention consists—1. In bringing together simultaneously, in a suitably constructed furnace, three different substances, viz., air, powdered coal or other carbonaceous powder, and a metallic ore, previously calcined and pulverized, so as to effect an immediate or instantaneous reduction and fusion of the metal. And 2. In combining with the aforesaid furnace another for calcining, combining, annealing, or cementing metals or ores, and adapted for calcining the ores which are to be subsequently pulverized and reduced in the first furnace.

FINCH, THOMAS FREEMAN, of Lidbury-street, Worcester. *Improvements in the manufacture of buttons.* Patent dated April 22, 1854. (No. 927.)

This invention relates to the manufacture of leather buttons suitable for boots, shoes, gaiters, overalls, &c. The manner in which it is performed is as follows:—the inventor takes a piece of sole leather, in a damp state, and secures it to a bench, and, by means of a brace and centre-bit, cuts circles or circular pieces nearly through the leather; he then turns it over, and by the aid of another centre-bit cuts the pieces completely out of the leather, and opens out the hole made by the centre-bit, by means of a punch. In this state the leather is ready for forming the head or solid part of the button. The shank is cut out of what is known in the trade as upper-leather; both ends being larger than the centre. The head and shank being both prepared, the central part of the shank is forced, by means of a hand-punch, through the head, and caused to form a loop at the underside of it. The inventor then makes a hole with an awl through the head of the button and that of the shank which has been forced through it, and inserts a piece of metal wire or a hard wood peg, whereby the shank is securely fastened to the head. The two ends of the shank are trimmed off the head of the button, which may now be dyed or coloured if required, and placed in heated dies and pressed, after which they are ready for sale.

GILL, JOSEPH, of Marsala, in the Kingdom of the Two Sicilies, merchant. *Improvements in apparatus for the distillation of spirituous liquors.* Patent dated April 22, 1854. (No. 928.)

This invention mainly consists in the use of a mass of flint, pebbles, or small fragments of any suitable hard substance that will resist the corrosive action of the liquid operated on, as a substitute for the metallic traversing shelves or diaphragms, usually

employed to spread the wine or wort over a large surface.

GALLOWAY, ROBERT, of Lambeth, Surrey, engineer. *Improvements in the construction of furnaces.* Patent dated April 22, 1854. (No. 929.)

A full description of this invention was given in our last number.

WARREN, JAMES, of Old Broad-street, London. *Improvements in the construction of railways.* Patent dated April 22, 1854. (No. 931.)

This invention mainly consists in a method of constructing a permanent way, "composed of a series of tubes or angular blades of cast or wrought iron, joined together by flanges and bolts or in any other way, so as to connect the ends to form upon the angles a continuous longitudinal sleeper and rail."

BLANK, CHARLES EMILIUS, of Trump-street, London, merchant. *Improvements in winding or reeling yarn into hanks.* (A communication.) Patent dated April 24, 1854. (No. 932.)

On the outer edge of each of several longitudinal blades are fixed continuous projections, which are to do the work assigned to the pegs in a former specification of the patentees.

BUDDO, DAVID, of St. Andrew's, Fifeshire, surgeon. *A magnetic weather-gauge, to give warning of the approach of gales and storms, &c.* Patent dated April 24, 1854. (No. 933.)

The principle on which the instrument is constructed is that of substituting for the column of mercury in the common barometer "a mechanical force applied to the separation of two bodies previously held together by the power of magnetic attraction."

POOLE, MOSES, of the Avenue-road, Regent's-park, Middlesex. *Improvements in washing garments and fabrics.* (A communication.) Patent dated April 24, 1854. (No. 935.)

This invention consists in the employment of floating balls in the process of washing, and in forcing the clothes through the mass of balls as they float in the fluid employed.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for casting type.* (A communication.) Patent dated April 24, 1854. (No. 937.)

This invention mainly consists in making the mould and mould bricks adjustable for the purpose of facilitating and ensuring accuracy in the fitting or working of the various parts, and whereby the mould and mould-brick can be altered with facility to suit letters of different thicknesses; and in the use of a moveable stopper, capable of moving independently of the piston or plug, for the purpose of preventing the back flow of the molten metal from the nipple-chamber.

COMBE, JAMES, of Belfast, Antrim, Ireland, machine-maker. *Improvements in machinery for hackling flax and other fibrous substances.* Patent dated April 24, 1854. (No. 938.)

The principal part of these improvements relates to a mode of applying to the machine, known as the Belfast Flat or Sheet Machine, the plan of hackling both sides of the stricks of flax on the same lines of hackles, by reversing the direction of their motion.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *The application of a new or improved material or substance to the construction of certain parts of machinery.* (A communication.) Patent dated April 24, 1854. (No. 939.)

The inventor proposes to employ a composition of India-rubber and sulphur, with or without shellac or gutta percha and sulphur, subjected to a high degree of heat, in the manufacture of spindles, rollers, shuttles, &c., for the purpose of making them light and strong.

DODDS, THOMAS WEATHERBURN, of the Holmes Engine and Railway-works, Rotherham, York, engineer. *Improvements in furnaces and fire-places for effecting a more perfect combustion of fuel and prevention of smoke.* Patent dated April 24, 1854. (No. 940.)

This invention consists in the employment of a series of hollow auxiliary bars, through which the water of the boiler (when the furnace is applied to a steam-generator or water-heater) is allowed to circulate. The smoke or bituminous vapour of the fuel is caused to pass through the fuel that has been previously coked, and which is pushed forward on to the auxiliary bars.

DAVIDSON, JONATHAN, of Edinburgh, Midlothian, machine-maker. *Improvements in breakwaters.* Patent dated April 24, 1854. (No. 941.)

The inventor constructs a breakwater of wood, &c., in such manner that the mean specific gravity of the structure is about one-half that of water. The parts are combined so as to make the whole stiff and rigid, that it may not yield or bend to the shape of the waves. The breakwater is to be moored so as to rise and fall freely with the tide.

BLACKWOOD, WILLIAM, of Arthurlie, Renfrew, bleacher. *Improvements in the treatment and finishing of threads or yarns.* Patent dated April 24, 1854. (No. 942.)

This invention consists of a vertical frame carrying an upper and lower horizontal shaft capable of revolving on bearings in standards. The overhanging ends of these shafts carry broad drums or pulleys of metal made hollow, so as to afford receptacles for steam to heat the thread which is finished

in the form of hanks. The hanks are passed upon the respective upper and lower pulleys or drums on each side of the framing, and they are stretched during the finishing action by proportionately separating the two shafts.

STURGES, RICHARD FORD, of Birmingham, Warwick, manufacturer. *An improvement or improvements in joining metals.* Patent dated April 25, 1854. (No. 943.)

*Claim.*—Joining or soldering metals or metallic alloys (to be afterwards electro plated with gold or silver), by means of a solder consisting wholly or mainly of cadmium.

COLLIER, WILLIAM, of Weston, Chester, chemist. *Improvements in evaporating-pans for concentrating solutions of certain acids, alkalies, and salts.* Patent dated April 25, 1854. (No. 946.)

These improvements relate to the manufacture and employment of double-bodied pans, so constructed that the external pan acts merely as a steam-jacket or casing around the internal pan, the two being secured together where their upper edges meet; a pipe is fitted to one side, and through it steam is admitted, and another attached below, and through this the condensed steam is carried off.

LAWSON JOHN, and SOMERVILLE DEAR, both of Leeds, York, machinists. *Improvements in looms for weaving.* Patent dated April 25, 1854. (No. 949.)

This invention comprises the application of two cones, which produce a differential motion for regulating the delivery of the yarn or warp from the beams; and the combination of the common drag arrangement (used in those looms which positively take up the fabric as it is woven), with any self-regulating differential yarn or warp-delivering motion.

CROSLAND, EDWARD, of Rochdale, Lancaster, manager, and THOMAS BOARDMAN, of Westhoughton, same county, weaver. *Improvements in weaving, and in machinery for manufacturing cut pile and other fabrics.* Patent dated April 27, 1854. (No. 952.)

*Claims*—1. An improved mode of weaving double fabrics, in which the distance between the fabrics is governed by varying the stroke of the reed. 2. An improved combination of parts for varying the stroke of the reed. 3. An improved guide for regulating the distance between two fabrics woven together, and for tightening the figure-warp. 4. An improved instrument for cutting the figure-warp of double fabrics. 5. An improved combination of machinery for varying the position of the drop-box.

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PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

KIRKHAM, JOHN, of Tonbridge-place, Middlesex, civil engineer. *Improved means of consuming smoke in furnaces.* Application dated April 19, 1854. (No. 900.)

The inventor proposes to furnish a supply of air heated by means of pipes, or in a chamber contiguous to or forming part of the furnace or flues.

HADDAN, JOHN COOPE, of Chelsea, Middlesex, civil engineer. *Improvements in adhesive stamps and labels.* Application dated April 19, 1854. (No. 901.)

This invention consists in making the perforations of perforated labels with angles presented in the direction of the intended separation.

JEYES, JOHN, of Northampton, merchant. *Improvements in the manufacture of pulp suitable for paper-making.* Application dated April 19, 1854. (No. 902.)

The inventor washes and treats with alkaline leys the refuse of tan-yards—viz., oak-bark, after it has been used in the tanning of leather.

BRIGGS, JEREMIAH, of Derby, gentleman. *A means of communicating intelligence from one part of a railway-train to another, and from one place to another.* Application dated April 19, 1854. (No. 903.)

This invention consists in communicating intelligence through a winding flexible acoustic pipe or tube.

CLARKE, HENRY, of Lincoln, manufacturer. *Improvements in cannons, guns, and other fire-arms.* Application dated April 19, 1854. (No. 904.)

This invention consists in constructing fire-arms with breeches revolving vertically. Field-pieces are to be formed with several breeches arranged side by side, with a barrel to each, and inclined planes, down which the charges slide to the apertures of the breeches. The inventor also proposes to discharge field-pieces by means of electric batteries to be carried with them.

HUNT, EDMUND, of Walcot-square, Kennington-road, Surrey, chemist. *Improvements in treating minerals for the extraction of their valuable metals.* Application dated April, 1854. (No. 907.)

The inventor subjects the minerals to heat in a reverberatory or other furnace, plunges it into water to render it friable, crushes and washes it by any ordinary contrivance, and then proceeds with the amalgamation.

PYM, JOHN, of Bangor, Carnarvon, engineer. *Improvements in the manufacture of pipes for the transmission of water and other fluids.* Application dated April 20, 1854. (No. 909.)

This invention consists in forming pipes of blocks of slate bored and connected together.

REED, JOHN MONTGOMERY, of Northumberland-street, Strand, Middlesex. *Im-*

*provements in the treatment of amalgams.* Application dated April 20, 1854. (No. 911.)

This invention "consists in the application of electricity so as to separate the solid metals from the mercury and render the extraction easy, also to purify them and free them from dross and scoria."

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *An improved apparatus for discovering the leakage or escape of gas.* (A communication.) Application dated April 20, 1854. (No. 914.)

This invention relates to an arrangement of apparatus for discovering any leakage or escape of gas in buildings lighted by it, and consists in forcing a certain quantity of atmospheric air into the pipes and apparatus connected therewith, by means of a force pump.

WOOD, THOMAS, of Culcheth, Lancaster, engineer, and SAMUEL HOWARD HEGINBOTTOM, of the same place, bleacher and dyer. *Improvements in metallic pistons for steam engines and pumps.* Application dated April 21, 1854. (No. 915.)

The inventors make the piston in one piece to fit as nearly as possible the inside of the cylinder, and sink in the periphery of it a groove to admit a spiral spring, which is merely placed round, so as to expand, in order to go over the largest part of the piston, and then sink into the groove and clip it tightly. They then place metallic segments of a circle upon the spring to fit into the groove and project a little beyond the surface.

CRIKMER, RICHARD JEX, and FREDEDICK WILLIAM CRICKMER, of Bermondsey, Surrey, engineers. *Improvements in cannons and field pieces.* Application dated April 21, 1854. (No. 917.)

This invention consists in constructing cannon with two or more revolving barrels, placed on opposite sides of, or around an axis, and mounted on a carriage in a frame free to revolve about a centre.

CANMELL, CHARLES, of Cyclops Steel Works, Sheffield, York, steel-manufacturer. *Improvements in the permanent way of railways.* Application dated April 21, 1854. (No. 918.)

This invention consists in making the rails for the permanent way of bars of steel, or of iron cased with steel, or of case-hardened iron.

COLLYER, ROBERT HANHAM, of Norfolk-street, Strand, Middlesex, Doctor of Medicine. *Improved machinery for crushing or triturating hard substances.* Application dated April 21, 1854. (To. 919.)

This machinery "consists principally of one or more heavy rollers, cylinders, or segments of cylinders, either plain or fluted on their surfaces, and made to vibrate or oscillate in a concave bed."

MINSHULL, SAMUEL, bronzist, and CHARLES AUSTIN, land-agent, both of Birmingham, Warwick. *Improvements in securing and fastening the lids of boxes or cases used for packing manufactured or other goods.* Application dated April 21, 1854. (No. 921.)

This invention consists in the application to such lids of a metallic clamp or strap provided with a hinge-joint, which comes down over the sides or top, and is united to a corresponding part, having a projecting stud, which fits into a hole in the strap, and is there held by a screw or pin.

STEPHENS, WILLIAM BRITTON, of Mark-lane, London, merchant. *Improvements in lamps.* (A communication.) Application dated April 21, 1854. (No. 922.)

This invention consists of an improved arrangement of an oil-bag or flexible reservoir working under pressure without friction, and maintaining a constant height of the oil-column throughout a stroke of any given length.

HARLOW, JOHN, of Moseley, Worcester, printer. *Improvements in the manufacture of paper, pasteboard, and millboard.* Application dated April 22, 1854. (No. 926.)

This invention consists in introducing and pasting or otherwise fixing between two or more sheets of paper, pasteboard, or millboard, one or more layers of suitable woven textile fabric, such as canvas, linen, calico, &c.

GOODCHAP, WILLIAM, of Walbrook-house, Walbrook, London, accountant. *Improvements in obtaining power by carbonic acid gas.* (A communication.) Application dated April 22, 1854. (No. 930.)

This invention consists in improvements in the apparatus employed when using liquified carbonic acid gas as a means of obtaining power. The gas having been obtained in the liquified state, in a suitable receiver, is withdrawn by means of a force-pump worked by the engine, and forced into a series of tubes contained in a series of reservoirs filled with heated oil, by which the liquified gas becomes heated and expanded and passes into one or other of two chambers fixed at the ends of the cylinder, in which works a piston as in a reciprocating steam engine.

HART, CHARLES, of the Vale of White Horse Ironworks, Wantage, Berkshire, agricultural engineer. *An improvement in the mode of applying power to combined threshing and dressing machines.* Application dated November 24, 1854. (No. 934.)

This improvement consists in the introduction and employment of a second or

supplemental pulley and shaft, the pulley being placed with its periphery projecting in the line of the driving-strap so as to take motion from it as it revolves round the driving-wheel and the small pulley in the ordinary way.

WILSON, JOHN, of Croydon, Surrey, gentleman. *Improvements in the construction of portable houses and other buildings.* Application dated April 24, 1854. (No. 936.)

The framework of the improved buildings is composed of wood secured at the angles with wooden or iron chairs or supports. The sills, plates, standards, quarters, or rafters are connected together by a double-action screw draw-bolt, with nuts and dovetail plates or washers securing the whole of the building together at the same time.

DANCHELL, FREDERICK LUDEWIG HAHN, of Acton, Middlesex, engineer. *Improvements in obtaining and applying motive power.* Application dated April 25, 1854. (No. 944.)

This invention consists—1. In raising and removing liquids and fluids by the direct application of steam, in the form of a jet, within a tube or series of tubes. And 2. In causing motion thereby, either to the tubes themselves or to bodies outside or inside the tubes.

BEAUREGARD, FELIX ALEXANDER TESTUD DE, civil engineer, of Paris, France. *Certain improvements in the manufacture of inks, and in the preparation of papers for receiving the same.* Application dated April 25, 1854. (No. 945.)

In lieu of applying a coloured ink or pigment on an unprepared paper in the ordinary manner, the inventor employs one of the component parts of an ink or pigment as a preparation for the paper, and writes on the prepared paper with another component part or ingredient of the ink or pigment, by which means the pigment is formed upon or in the substance of the paper; or he prepares a colourless or but slightly coloured ink, which becomes dark after its application to the paper.

ELLIS, RICHARD, carpenter, and JAMES WILLIAM MARTIN, cooper, of the parish of St. James's, Westminster. *Improvements in the mode of drying or desiccating by the agency of atmospheric air.* Application dated April 25, 1854. (No. 947.)

This invention consists in whirling bodies through the air with a rotatory motion.

AITKEN, JOHN, of Douglas, Lanark, engineer. *Improvements in sawing machinery.* Application dated April 25, 1854. (No. 948.)

This invention relates to a mode of improving the action of circular saws by placing a fly-wheel upon the saw-spindle.

## PROVISIONAL PROTECTIONS.

*Dated September 4, 1854.*

1927. James Parker, of Birmingham, Warwick, locomotive superintendent. An improvement or improvements in the smoke-boxes of locomotive engines.

*Dated October 4, 1854.*

2127. John Kershaw, of Stockport, Chester, manager. Certain improvements in self-acting mules.

*Dated October 11, 1854.*

2175. William Henry Tayler, chemist, South-row, New-road, St. Pancras, Middlesex. Improvements in cartouch-belts or cases for containing cartridges to be worn round the waist, or otherwise, calculated for arms of every description, guns, pistols, and other fire-arms.

2177. Robert Cruise, of Manchester, Lancaster, engineer. Improvements in machinery or apparatus for stopping railway carriages.

2179. Thomas Shaw, of Preston, Lancaster, machine-maker, and Richard Dixon, of the same place, machine-maker. Improvements in slubbing, roving, and jack-frames employed in the preparation of cotton and other fibrous substances.

*Dated October 12, 1854.*

2181. William White, of York Villa, Kensington-park, Bayswater, consulting chemist. Improvements in the manufacture of manures.

2183. Ancel Alexander Routledge, of Neath, Glamorgan. Improvements in the manufacture of detonating railway signals.

2185. Alexander Parker, of New Milns, Ayr, pattern-cutter. Improvements in ornamental weaving.

*Dated October 13, 1854.*

2189. Sir James Caleb Anderson, of Fermoy, Cork, Ireland, baronet. Improvements in locomotive engines.

2191. Charles Frederick Stansbury, of the firm of Nourse and Co., of Cornhill, London. Improved apparatus for heating buildings. A communication.

2193. William James Barsham, of Stratford, Essex, gentleman. Improvements in machinery or apparatus for crushing mineral and other substances.

*Dated October 14, 1854.*

2195. John Harrison, of Brighouse, York, millwright and engineer. Improvements in the bosses applied to millstones.

2197. John Coope Haddan, of Chelsea, Middlesex, civil engineer. Improvements in the manufacture of cannon, and of projectiles for the same.

2199. Soren Hjorth, of Copenhagen. An improved electro-magnetic machine.

2201. Robert Pinkney, of Long-acre, Middlesex. Improvements in bottles, jars, and other like vessels, and in the method of stoppering them.

2205. John Henry Pape, of Paris, Rue des Bons Enfants. Improvements in the manufacture of boots and shoes.

*Dated October 16, 1854.*

2207. Thomas Edwin Moore, of Great Titchfield-street, Oxford-street, Middlesex, engineer. Improvements in apparatus for sharpening knives, scissors, and other similar edged tools.

2209. Nathan Thompson, junior, of New York, United States of America. Improvements in life-preserving seats.

2211. William Rossiter, of Goswell-road, Middlesex, paper-manufacturer, and Matthew Edwin Bishop, of Cannon-street West, London, wholesale stationer. Improvements in the manufacture of

pulp suitable for paper, pasteboard and millboard, papier-maché, and other like purposes.

2213. William Wain, of Brunswick-street, Stamford-street, Southwark, engineer. Improvements in the construction of screw propellers.

*Dated October* 17, 1854.

2215. William Henry Child, of Providence-row, Finsbury, London, brush-manufacturer. Certain improvements in the manufacture and construction of brushes.

2217. John Coghlan, of Craven-street, Strand, Middlesex, civil engineer. An improved mode of signalling on railways by electric telegraph.

2219. John Lawes Cole, of Henry-street, Salmon's-lane, Limehouse, Middlesex, engineer. An improved construction of portable drill.

2221. Alfred Illingworth and Henry Illingworth, of Bradford, York, spinners. Improvements in machinery or apparatus for combing wool and other fibrous substances.

*Dated October* 18, 1854.

2229. Geroge Hamilton, of Great Tower-street. Improvements in obtaining soundings.

2231. Benjamin Franklin Cooke, of Boston, Massachusetts, United States of America, gentleman. An improved mode of caulking ships, applicable also to the rendering of roofs waterproof.

2233. Howard Ashton Holden, of Birmingham, Warwick, manufacturer. Certain improvements in roof-lamps for railway or other carriages, and for parts used in connection with the same.

*Dated October* 19, 1854.

2235. Benjamin Nicoll, of Regent Circus, Piccadilly, Middlesex, and Lombard-street, London, shirt-maker. Improvements in shirt-fronts.

2237. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the construction of grates. A communication.

2239. Thomas Biggart, of Dalry, Ayr, spinner, and Allan Loudon, of the same place, mechanic. Improvements in regulating motive-power engines.

*Dated October* 20, 1854.

2241. William Marsh, of Bywater-street, King's-road, Chelsea, Middlesex, upholsterer. An improved rocking and lounging chair.

2243. Thomas Allan, of Adelphi-terrace, Westminster, civil engineer. Improvements in applying electricity.

*Dated October* 21, 1854.

2245. Julius Smith, of Gainford-place, Barnsbury-road, and Frank Sandom Thomas, of South-terrace, Walworth. An improved apparatus for steering ships and other vessels.

2247. William Alexander Edwards, of Brooke-street, West-square, Lambeth, Surrey, engineer. Separating iron or steel from brass, gun-metal, and all other metallic filings.

2249. Abraham Gerard Brade, of Paris, France, and Salisbury-square, London. Improvements in the manufacture of gas-fittings. A communication.

2251. William Green, of Howard-buildings, Brick-lane, St. Luke's, Middlesex, engineer, and Joseph Pickett, of Duke-street, London, manufacturer. Improvements in treating or ornamenting textile materials or fabrics and paper, and in machinery or apparatus for effecting the same.

*Dated October* 23, 1854.

2253. Henry Hales, of Brighton, Sussex, gentleman. Improvements in the machinery for propelling vessels.

2255. Abraham Gerard Brade, of Paris, and Salisbury-square, London. Improvements in the manufacture of plate and thread for gold and silver lace and bullion. A communication.

2256. John Maddox, of Thomas-street, Brick-lane, Edward Gardner, of Buxton-street, and George Dyer Green, of Weaver-street, Middlesex. Improvements in weaving fringes.

2257. George Simmons, of Liverpool-street, London, civil engineer. Improvements in the construction of railway bearers and sleepers.

2259. James Scott, of Argyle-square, Edinburgh, M.D. Improvements in apparatus for facilitating surgical operations and teaching anatomy.

*Dated October* 24, 1854.

2261. Charles Cowper, of Southampton-buildings, Middlesex. Improvements in preparing to be spun, and in spinning silk waste. A communication.

2263. Gustavus Adolphus Somerby and Charles William Fogg, of Massachusetts, United States of America. An improved brake apparatus for railway carriages.

2265. Ferdinand Charles Warlich, of Suffolk-street, Middlesex, gentleman. Improvements in generating steam.

2267. John Welsh, of Greenock, Renfrew, sergeant of police. Improvements in extracting liquids from saccharine and other matters.

*Dated October* 25, 1854.

2269. Joseph Spencer, of Bilston, Stafford, iron-founder. A new or improved fence for railway stations, docks, and such other places as the same is or may be applicable to.

2271. Alexander Southwood Stocker, of the Poultry, Cheapside, London, manufacturer. Certain improvements in the manufacture of tubes applicable to gas and other purposes, also in the construction of certain engineering machinery and apparatus, and the application of the whole or part of the same to, and other means to be used or employed in, the manufacture of tubes, also in the mode of manufacturing and the application of certain articles connected with or necessary to the completion of such or other tubes.

2273. William Thomas Smith, of New Hampstead-road, Kentish Town, Middlesex, surveyor, and George Hill, of the City-road, gentleman. Improvements in machinery or apparatus for winnowing, washing, sifting, or separating corn, gravel, minerals, and other materials.

2275. Colin Mather, of Salford Ironworks, Manchester. Improvements in machinery for boring in the earth, and for actuating a hammer for driving tubes into the earth, and other uses.

2277. Edouard Pechenard, contractor, of Monthermé Canton, French Empire. Certain improvements in roofs or coverings for buildings.

2279. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in circular looms. A communication from M. Poivret.

*Dated October* 26, 1854.

2281. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved method of obtaining alcohol from organic substances, and particularly from wood. A communication.

2283. Joseph Eccles, of Blackburn, Lancaster, cotton-spinner. Improvements in machinery for the manufacture of bricks.

2285. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in bleaching, dyeing, and preparing hemp and flax to be spun. A communication from Messrs. A. and H. Six, of Wazemmes-les-lille.

2287. James Griffiths, of Wolverhampton, Stafford, engineer. Improvements in the mode or process of manufacturing certain kinds of iron, and in the machinery or apparatus used in such manufacture, parts of which improvements are also applicable to machinery used in the manufacture of other descriptions of iron.

*Dated October* 27, 1854.

2289. Auguste Edouard Loradoux Bellford, of Castle-street, London. An improved mode of operating trip hammers. A communication.

2290. John Turner, overlooker, Benjamin Holdsworth, overlooker, and Robert Hartley Beamer, of Burnley, Lancaster. Certain improvements in power looms for weaving.

2291. Astley Paston Price, of Margate, Kent, chemist. Improvements in the calcination and oxidation of certain metallic, mineral, and metallurgical compounds, and in the apparatus and means for effecting the same.

2292. William Ashton, of Preston, Lancaster, engineer. Improvements in safety or escape-valves.

2293. William Boutland Wilkinson, of Newcastle-on-Tyne, plasterer and manufacturer of artificial stones. Improvements in the construction of fireproof dwellings, warehouses, and other buildings, or parts of the same.

*Dated October* 28, 1854.

2294. Henry Adcock, of London, civil engineer. Improvements in strengthening castings of iron and other metals.

2295. Jabez Morgan, of Kidderminster, Worcester, engineer. Improvements in machinery or apparatus for cutting metals.

2296. George Mumby, of Hunter-street, Brunswick-square, Middlesex, mechanical draughtsman. Improvements in reservoir penholders, and other writing apparatus.

2297. Edward Lindner, of New York, United States of America. Improvements in revolving breech fire-arms and magazine.

2298. Jean Pierre Savouré, of Catherine-street, Strand, Middlesex, and Rue de la Saunerie, Paris, France. An improved gold coin detector, applicable also for weighing postal communications.

2299. Charles Blake, of St. Leonards, Sussex, painter. A method of preventing or lessening the injurious effects arising from collisions at sea, and on other navigable waters.

2300. Claude François Vauthier, engineer, of Dijon, French Empire. Certain improvements in blowing-machines.

2301. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in centrifugal machines, and in driving the same. A communication.

*Dated October* 30, 1854.

2302. Oliver Maggs, of Bourton, Dorset, iron-founder. Improvements in portable steam engines.

2304. John Wainwright, of Birkenhead, Chester, surgeon dentist. Improvements in fitting up shops, offices, and other like places and shop fronts.

2305. John Coope Haddan, of Chelsea, Middlesex, civil engineer. Improvements in projectiles, and in machinery for manufacturing the same.

2306. Pierre Benoit Chapuis, of Place des Repentirs Guilliotière, Lyons, France. An improvement in the harness used for weaving. Partly a communication.

2308. Robert Stirling Newall, of Gateshead. Improvements in electric telegraphs. A communication.

2309. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in axle-boxes. A communication from Benjamin Laurent, of Houécourt, France, manufacturer.

*Dated October* 31, 1854.

2311. William Reid, of University-street. Improvements in the manufacture of galvanic batteries.

2315. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in lithographic printing-presses. A communication from Pierre Désiré Vaté, of Paris, France, machinist.

2317. Bewicke Blackburn, of Clapham Common, Surrey. Improvements in the manufacture of pipes.

*Dated November* 1, 1854.

2321. James Rae, of Alpha-road, New-cross, Kent, civil engineer. Improvements in machinery or apparatus for assisting in propelling vessels.

2323. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved method of forging or swaging railroad carriage and other wheels. A communication.

2325. Joseph Francis, of New York, U.S.A. The manufacture of wagons, caissons, and other vehicles, applicable to transport military and other stores on land and water.

## PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2319. George Taylor, of Holbeck, near Leeds, York. Certain improvements in mills for grinding corn and other substances. November 1, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November* 14*th*, 1854.)

1457. Joseph Sunter. New or improved drilling-machinery.

1462. Jean André Cécile Nestor Delpech. An improved lift and force pump, called "Castraise Pump."

1479. Samuel Harvard and Joshua Womersley. Heating crushed seed for making cake, for drying seeds, corn, and other grain, and for feeding millstones, or other grinding apparatus.

1497. Alfred Vincent Newton. An improved construction of pump for raising and forcing fluids. A communication.

1499. Joseph Ellisdon. Improvements applicable to reading, lounging, and other chairs.

1501. Thomas Waller. Improvements in the construction of stoves and other fireplaces.

1505. The Honourable James Sinclair, commonly called Lord Berriedale. Improvements in the manufacture of paper, and in the production of textile materials.

1507. Thomas Schofield Whitworth. Improvements in machinery or apparatus for cutting or shaping wood, parts of which are particularly applicable in the construction of spinning-machinery.

1509. David Beck. Improvements in brewing and distilling.

1517. Thomas Richards Harding. An improved mode of doffing fibrous materials from hackle-cylinders, and gill or porcupine, or preparing-rollers.

1521. William Houghton and Robert Hoyle. Improvements in machinery for spinning and doubling cotton and other fibrous substances.

1525. Luke Cooke. Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.

1538. John Greenwood and Robert Smith. Certain improvements in sizeing, stiffening, and finishing textile materials or fabrics.

1592. Jean Barthélemy Gillet. Improvements in capstans, winches and windlasses.

1596. John Hackett. Covering India-rubber thread, whether vulcanized or otherwise, with sewing silk and with other articles.

1600. Toulssaint Delabarre and Leon Bonnet

The preservation of meat in its natural state, and without being cooked.

1679. Auguste Edouard Loradoux Bellford. An improved method of engraving. A communication.

1709. Louis Player Miles. Improvements in the construction of locks.

1749. John Hackett. Improvements in the manufacture of garments, or of parts of garments, or of appendages or appliances to garments.

1761. Thomas George Taylor. The use or application of the stalk of the hop-plant in the manufacture of paper, pasteboard, and millboard, cordage, rope, and textile fabrics.

1762. William Woodcock. An improvement in the combustion of fuel.

1797. John Hackett. The manufacture of new and improved fabrics of cotton and of linen, and of cotton and linen combined.

1838. Robert Barlow Cooley. An improvement in gloves.

1846. James Lamb Hancock. An improved pneumatic safety inkstand.

1907. William Campion. Improvements in rotary knitting machinery.

1922. Thomas Craddock. Certain improvements in the steam engine.

1957. John Youil. Improvements in the mode or method of fermenting liquors, and in the machinery or apparatus employed therein.

2043. James Egleson Anderson Gwynne. Improvements in machinery for lifting, forcing, and exhausting.

2067. Joseph Boulton. Improvements in dry gas-meters.

2127. John Kershaw. Certain improvements in self-acting mules.

2179. Thomas Shaw and Richard Dixon. Improvements in slubbing, roving, and jack-frames employed in the preparation of cotton and other fibrous substances.

2188. James Lamb Hancock. An improved machine for ploughing or working land.

2193. William James Barsham. Improvements in machinery or apparatus for crushing mineral and other substances.

2200. Christopher Holt. Improvements in fastenings for the laths of iron bedsteads, couches, and other similar articles of furniture.

2209. Nathan Thompson, Junior. Improvements in life-preserving seats.

2249. Abraham Gerard Brade. Improvements in the manufacture of gas-fittings. A communication.

2255. Abraham Gerard Brade. Improvements in the manufacture of plate and thread for gold and silver lace and bullion. A communication.

2258. John Penn. Improvements in the manufacture of the pistons, slide valves, and stuffing-boxes of steam engines.

2263. Gustavus Adolphus Somerby and Charles William Fogg. An improved brake apparatus for railway-carriages.

2265. Ferdinand Charles Warlich. Improvements in generating steam.

2275. Colin Mather. Improvements in machinery for boring in the earth and for actuating a hammer for driving tubes into the earth and other uses.

2291. Astley Paston Price. Improvements in the calcination and oxidation of certain metallic mineral, and metallurgical compounds, and in the apparatus and means for effecting the same.

2308. Robert Stirling Newall. Improvements in electric telegraphs. A communication.

2325. Joseph Francis. The manufacture of wagons, caissons, and other vehicles, applicable to transport military and other stores on land and water.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council by George Shillibeer, coachbuilder, formerly of 7, Melton-street, Euston-square, Middlesex, but now of 1 and 2, Commercial-place, St. Luke's, praying Her Majesty to grant a prolongation of the letters patent granted to him 20th September, 1841, for "Improvements in the construction of hearses, mourning, and other carriages."

On the 20th December, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to that Committee to fix an early day for hearing the matters contained in the said petition, and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council-office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed November* 10, 1854.

1075. Richard Clarke Burleigh.
1143. Thomas William Atlee and George Jobson Atlee.
1213. John Whitaker and James Pickles.
1243. Richard Archibald Brooman.
1945. James Eden.

*Sealed November* 14, 1854.

1089. Anguish Honour Augustus Durant.
1099. Christopher Catlow and Thomas Comstive.
1114. Joseph Hinchcliffe, junior.
1115. Charles Barlow.
1116. John Cunningham and William Ashley.
1184. Thomas Bazley.
1193. Richard Tomlinson.
1206. William Edward Wiley and Edward Lavender.
1224. Benjamin O'Neale Stratford, Earl of Aldborough.
1242. James Bowman Lindsay.
1246. Hippolyte Bordier.
1262. John Wilson.
1324. George Holloway.
1337. Joseph Oliver.
1584. John Collis Browne.
1683. Jean Chrilottome Denis Demay.
1969. Henry Robert Ramsbotham and William Brown.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

The letters of several of our correspondents are unavoidably deferred.

*R. Cherbonneau.*—In looking over your former letter, it did not occur to us that it differed essentially from those with which we coupled it.

*D. J.*, of Accrington, writes as follows:—

"Sir,—Will you be kind enough to inform me, through the medium of your Magazine, whether the list of articles contained in the Society of Arts Journal comprises all that will be received for competition, or whether any model not mentioned in the list, providing it be something new, will be received, and allowed to stand its chance of premium? I have a model I had thought of sending for competition this session: but that department of mechanism to which it belongs is not named in the list. Information on this matter will be esteemed, &c., &c."

The Society of Arts does not receive, in competition for prizes, inventions of any other character than those suggested in their list for the year.

*Y.*—Had your reply to the letter of "A Mechanic," which appeared in our number for October 14, reached us earlier, it would have appeared in our pages. We regret that your unavoidable delay has deprived us of the opportunity of publishing it. Such discussions as that which your letter resumes, lose much of their interest if they are not unremittingly sustained.



## CONTENTS OF THIS NUMBER.



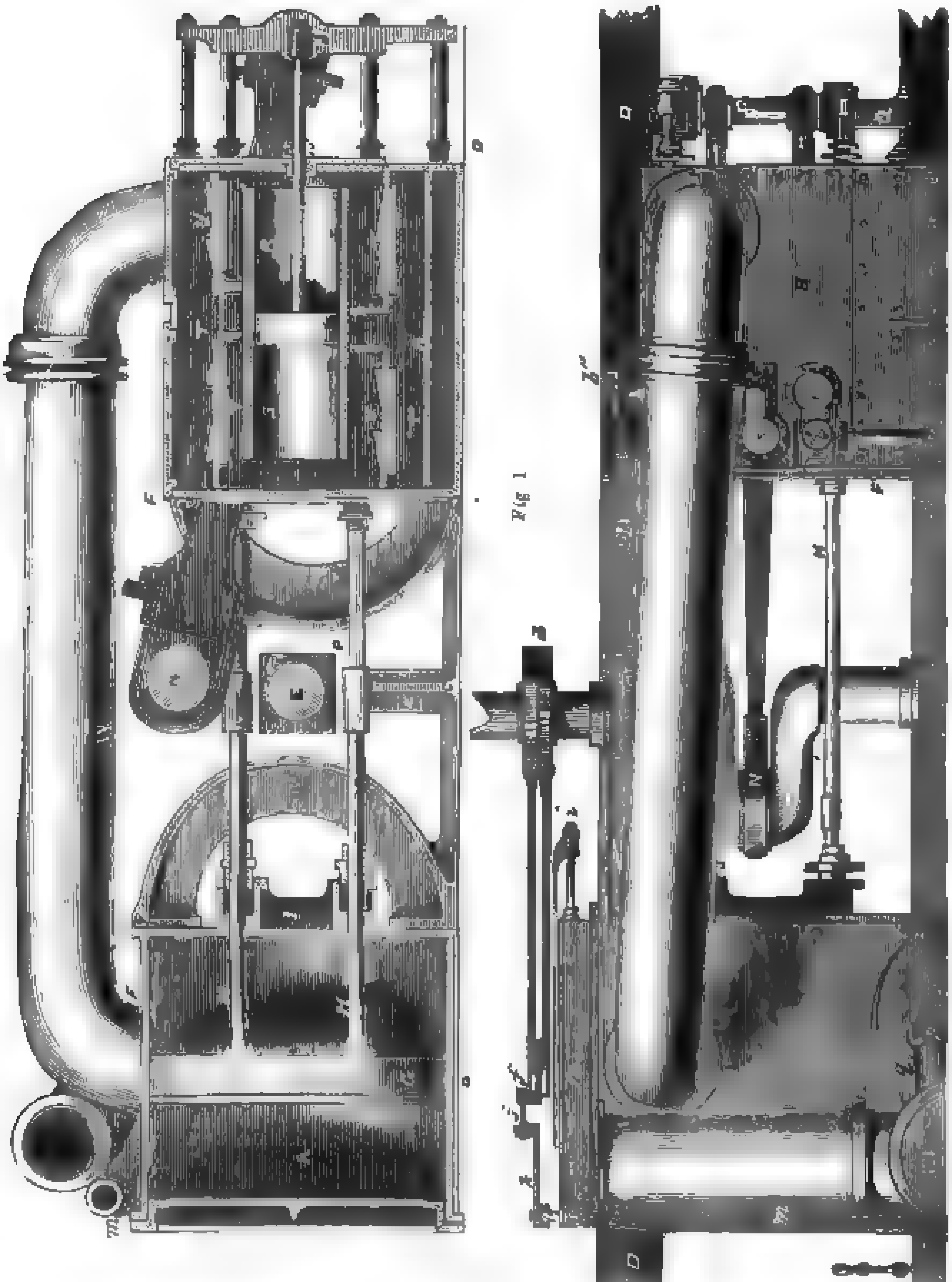
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1633.] SATURDAY, NOVEMBER 25, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## HARMAN'S PATENT IMPROVEMENTS IN STEAM ENGINES.



## HARMAN'S PATENT IMPROVEMENTS IN STEAM ENGINES.

(Patent dated April 12, 1853.)

Mr. W. Harman, of Northfleet, has patented an arrangement of steam engines for marine purposes, especially suited for driving the screw propeller direct, although its compact form renders it valuable for a variety of other employments. The cylinders and condensers are placed horizontally athwart the ship, the cylinders on one, and the condensers on the other side of the keel. Each piston is fitted with four piston-rods, which are carried through, and supported by the condensers, whilst they are united by cross-heads at their projecting extremities. The connecting-rods return back again from these cross-heads, through trunk openings in the condensers, to the screw-shaft, the line of which runs between the cylinders and the condensers. The air-pumps, bilge-pumps, and hot-water pumps, are all cast in the condensers, and are worked from the piston cross-heads.

Fig. 1 of the engravings on the preceding page represents a plan of a pair of engines of this kind, taken from the middle line. Fig. 2 is a corresponding longitudinal section of the same. The steam cylinders, A, and the condensers, B, are cast with flat bases, C, to rest on the level surface of the cross-sleepers, D, of the ship's floor, and they are connected together across the line of keel by the transverse engine-frames, D′ D′. These frame-pieces are each formed with four abutting ends, springing from arches or curved portions, and resting upon the floor, to carry the screw-shaft, E, and connections, whilst face-pieces are cast on the cylinders and condensers at F, for connection with the cross-frames. Each steam piston, G, has four rods, H, combined parallelogram-wise, and working through corresponding stuffing-boxes in the cylinder-covers, I, which face towards the screw-shaft or keel line. Each set of four piston-rods, H, passes right over the keel line, and is combined with a single frame by the two vertical cross-heads, J, working outside the condenser, and between it and the ship's side. This arrangement of the piston-rods obviously necessitates their passing through the condensers, and hence guide-trunks are cast in the condensers in a horizontal direction; these guides being fitted with brasses on each end of the condenser, to answer as the parallel guide motion for the piston-rod movement. This passage of the piston-rods through the condensers is the only guide required for them, and their cross-heads, J, consequently work quite free outside the condensers. To the straight horizontal bar of each cross-head the double eye or forked end, L, of the connecting-rod is jointed in the usual way; and this rod passes back thence through an elliptical open-ended trunk, M, cast within the condenser, and admitting of the free play of the connecting-rod within it. The other end of the connecting-rod proceeds direct to the crank, N, on the main screw-propeller shaft, E, which at this part is carried in bearings on the transverse arched framing-pieces, D′. The cross-heads, J, are connected together by the pin or spindle, P, the head of which, Q, is elongated so as to attach the spindle, R, which passes to work the bucket of the air-pump, S, in the interior of the condenser. The two air-pumps are ranged close together, side by side, at the junction of the two condensers, or may be placed outside the condensers. They are open at each end, communicating directly with their surrounding rectangular chambers, T, which are fitted with upper and lower tiers of clack-valves, U. Each pump has thus four sets of clacks, all opening upwards; and, as each end of the pump opens into a distinct division, the pump is double-acting, the water and vapour of condensation being alternately drawn into and expelled from each end of the working cylinder from the base, V, of the condenser. The influx is through the bottom tier of valves, and the discharge by the corresponding upper tier, the waste steam being brought from the exhaust ports of the steam cylinders by the two inclined pipes, W, opening into the tops of the condensers, whilst the air-pump discharge is through the thoroughfares. The bilge and hot water pumps are also cast within the condensers, each main cross-head, J, having transverse pieces upon it for carrying the pump-spindles. The injection valve-lever is at *b*′, close to the starting wheel; and a link-rod from it passes over the engines to a bell-crank fixed on a spindle across the engines, whence short links communicate with the injection-valves, *b*″. The steam slide-valve casings of the main working cylinders are at *c*, outside each cylinder. The slide-valves are arranged with vertical faces, and each slide is worked by a pair of eccentrics, *d*, the rods of which are connected to the ordinary link movement, *e*, for reversing and expansion. The stud-pin, *f*, connecting the link with the slide-valve, is fast in a sliding-piece, the whole length of which is fitted to slide in a guide-groove on the back of the cover of the slide casing, whilst the other end is connected at *i* to the slide-valve spindle. Each link is supported in position by a connecting-rod, *j*, hung to the free end of a lever, *k*, fast on the end of a horizontal cross-shaft, *l*, working in bearings, *m*, on the cylinders. Both links are capable of being raised or lowered simultaneously for the stopping or reversing of the engines, or the adjustment of the expansion by the main central hand-wheel on the projecting end of the screw-spindle, *o*. This screw-spindle has upon it a traversing-

nut, *p*, fitted with side-studs, from which rods, *q*, pass back to corresponding levers on the shaft, *l*; the wheel end of the screw-spindle being supported by a crank, loose upon the shaft, *l*, and between the fixed levers; the other end of the screw-spindle, *o*, being supported by a bearing on the engine-framing. The suck-discharge and relief-valves, *s*, *t*, and *u*, for the hot-water pumps, are fixed on the top of the condensers in direct connection with the hot wells and pumps, and both sets are attached by a horizontal pipe running parallel to the steam pipes, and with a single branch in the centre, for conveying the water to the boilers. The steam from the boilers enters a branch in the centre of the horizontal steam pipe, which diverges in a line parallel to the engine-shaft, to convey the steam to each valve-chest or casing.

## THE "SCIENTIFIC AMERICAN,"

### AN UNSCRUPULOUS PLAGIARIST.

Brother Jonathan has hitherto strenuously resisted all attempts at international copyright, evidently calculating on "shaving the Britishers." It may not be the most honest course of proceeding, but it is evidently "smart"—the meaning of which word may possibly be, the power of making others smart under injustice. But with a consciousness that the appearance of respectability is essential, as it is said "hypocrisy is a tribute which vice pays to virtue," our go-a-head cousin puts on as many as possible of the phrases pertaining to the things he wishes to obtain credit for. These reflections have been called forth by some numbers of the *Scientific American* now lying before us. By the term "Scientific," many persons would understand a power of original research; of going to the depths of things; in fact, anything but the mere power of a parrot repetition. The *Scientific American* is a misnomer; the true designation would be the "*Knowing* American," in the sense in which *knowing* is understood by the "Turf," for the evidences are strong that the Editor is "more knowing than wise."

To our proof. On the 16th of September, 1854, the *Scientific American* gives notice:—"We shall not be able, as we intended, to commence our history of reaping-machines with illustrations for two weeks from this date. It will be the only complete history of the kind ever given to the public, and as the number of reaping-machines is not small, there are many conflicting claims with which every farmer should be well acquainted, if he wishes to save himself money and anxiety, and make himself thoroughly intelligent on a subject so intimately entwined with his interests."

After this promulgation of intended historical accuracy, the public had to restrain their impatience till September 30th, when there appeared an article headed—History of Reaping-machines, No. 1, followed on October 7, by History of Reaping-machines, No. 2; on October 14, by History of Reaping-machines, No. 3; on October 21, by History of Reaping-machines, No. 4; etc. In No. 1, the "Knowing American" says, "We propose to place before our readers an account of the various methods of gathering grain, grass, etc., from the remotest antiquity up to the present day, a description which shall be at once the most authentic, valuable, concise, and interesting that has ever been published."

After this flourish, like the trumpet of a wild beast show, and the usual "walk in, ladies and gentlemen," there is given a wood cut of a common hand sickle, preluded by the following paragraph:

"We trust that our researches will be appreciated by the intelligent farmer and artisan, not only as an interesting branch of mechanical history, but valuable in giving, as fully as possible, the accumulated knowledge of mankind in this important department of industry; and it is to be hoped that the machinist will no longer lose his time, in re-inventing that which is already old, but by comparing known inventions with each other, he will thereby be enabled to suggest new elementary forms of parts, new combinations, and perhaps a better mode of driving the apparatus."

In the "Appendix to the Specifications of English Patents for Reaping Machines," published in 1853, by Mr. Bennet Woodcroft, of the English Patent-office, a work prepared with much labour and skill, there occurs a paragraph as follows:

"This compilation may, therefore, not only be interesting as a branch of mechanical history, but valuable as giving, as completely as the writer can collect, the accumulated knowledge of mankind in this important department of industry; and by displaying the elementary forms of all known cutters, the combinations of all the parts forming each machine, and its mode of action, it is to be expected the machinist will no longer lose his time in re-inventing that which is already old, but by comparing all known inventions with each other, he will thereby be enabled to suggest new elementary forms of parts, new combinations,

and perhaps a better mode of driving the apparatus."

The "Knowing American" might call this a "curious coincidence," so we will go a little farther. Following the paragraph we have already reproduced, we find a wood-cut of the reaping-hook slightly altered, and immediately after it this paragraph:

"The time-honoured sickle, still in use, is the earliest known reaping implement,—we find it mentioned both in the Old and New Testaments; that it was used by hand only, and not a part of a machine, may be inferred from a passage in Isaiah xvii. 5; this was obviously the case in Egypt, judging from the bas relief upon some of the buildings and tombs, where reapers are represented using sickles, some with smooth and others with a serrated edge. Two of these ancient Egyptian iron sickles, much rusted, are displayed in the 'Gallery of Egyptian Antiquities,' in the British Museum, London."

In Mr. Woodcroft's book is a parallel passage:

"The sickle is an instrument for reaping of great antiquity. We find it mentioned in the Bible and New Testament, in the following passages:—Deuteronomy xiii. 24, 25; Isaiah xvii. 5; Jeremiah i. 16; Revelations xiv. 15, 16. From the statement in Isaiah it may be inferred that it was used in the hand only, and not as part of a machine. That this was also the case in Egypt is evident from the bas-reliefs upon some of the buildings and tombs (as delineated in the *Description de l'Egypte*, published by order of Napoleon), where reapers are represented using sickles, some with smooth and others with serrated cutting edges. Two of these ancient Egyptain iron sickles, much oxidized, with smooth cutting edges, are displayed in the lowest compartment of cases 33-35, in the Gallery of Egyptian Antiquities, in the British Museum. One of them was found by Belzoni, under a statue at Karnak."*

After this follows a similar copy of the plan of reaping in Java; the ancient Gallic method; Mr. Pitt's, of Pendleford, and so on, the text and wood-cuts being just so slightly altered as to pretend to be original. In the number for October 28, the Editor has got as far as the reaping-machine of Mr. Mann, of Cumberland, and has therefore used up about one-third of Mr. Woodcroft's volume. We presume the whole is to be treated in the same manner, and then it will probably be republished as a separate volume, the production of the deep research of the *Scientific American*. We deeply regret to see a journal, that might be abundantly useful if it were but honest, resort to so mean a practice. A more impudent piece of plagiarism we have seldom encountered. Some unscrupulous people steal thoughts, but here are stolen thoughts and language together, by wholesale, with a wilful change of words and terms here and there, as a most ostrich-like attempt to disguise the theft. The New York Dutchman, of whom the "Knowing American" complains for stealing his articles unacknowledged, can have done nothing equal in enormity to this. We trust that some of the multifarious journals in the American Union will steal this criticism of ours at full, either with or without acknowledgment, and reprint it, in order to open the eyes of their public to this sharp practice, in order at any rate that his neighbour journalists may each set up a claim to the originality of a plundered book. We shall return at a future time to the "Knowing American."

* Sixteenth Edition of the Synopsis of the Contents of the British Museum, page 207.

## ARE THERE MORE WORLDS THAN ONE?

NO. IV.

(*Concluded from page* 491.)

HAVING found no satisfaction in the arguments for an absolute negative, as conducted by the author of "The Plurality of Worlds," &c., and having been, on the other hand, confused rather than edified by the proof, or, we should say, declamatory protests of his opponents, we are necessarily thrown back upon our own resources when endeavouring to determine the probability remaining, after all their discussions still before our minds. We have, therefore, to indicate what we deem the true conditions of the case submitted to our reader, and very simply to point out where we are to halt on the failure of observed facts, although we may feel most anxious—as anxious as these writers can be—to form consistent opinions concerning the relations, operations, and destinies of the universe.

Now here, we are glad to remark, we start from a common point of agreement. The earth, it is allowed, evidences the most wonderful skill in its adaptation to the wants of the innumerable creatures it sustains, not merely, we intend to suggest when narrowing our remarks, because it appears that man may exist on its surface, but because it would show, if allowed to teach according to its own natural laws, how our race may live happily in the appropriation of its resources, and in the enjoyment of the noble faculties its arrangements may have assisted to develope. From its remotest antiquity, it has stored up inexhaustible wealth available

for advancing civilization; and on its surface it has thrown an ever varying and most touching beauty, to exercise the mental powers, encourage and refine the affections of the heart, and place us, by the acknowledgment of all moral relations, in harmony not only with all its creatures, but with the glorious Creator who holds them all together, and through them works out the plans of universal beneficence. And so, with its future destiny growing out of present conditions, and carrying with it all the possibilities involved, we might say, in the idea of its first design. Who will predict, then, what it will become when man is once more conformed to its most stringent requisitions, and when all its capabilities shall only be the expression, in another shape, of the positive good enjoyed by its creatures? This, then, is the earth, about which there is no dispute, and from which we must take our departure in speculations of the kind now soliciting our attention.

Admitting, then, the exquisite adaptation of matter to mind, and seeing how the study of the one necessitates a still higher development of the other, we are led to the admission of a great law of nature recognised by the human intellect, almost the first suggestion, coming upon us so early indeed, that it has been deemed, almost pardonably, an instinct of the reason. We intend to say, that we must feel the great Creator operates always according to the same unalterable rules of wisdom and of goodness; and that, consequently, we may adopt the philosophical axiom without fear of error, that if in any case we can discover the conditions in which He is working, we may conclude as to the result to be produced by the unerring hand, even in a different sphere of operation. But here in truth begins the difficulty, and therefore the labour of a studious philosopher. Are we sure, he asks, of all these conditions, when we predicate that at a given time certain phenomena must be seen in the works of the glorious Architect which are so distant from us, and which we are endeavouring to approach or understand in the application of analogies we have drawn from the limited opportunities enjoyed by us upon the earth for study and research?

Take the illustration before us. We have admitted the admirable suitableness of the earth for promoting the well-being of the creatures found on its present crust, and identified undoubtedly with all its forces and capabilities. Our natural tendency is, we say, to suppose at once that all other bodies situated like it, or "fitted up" (using a phrase of Sir D. B.) with all its conveniences, must be the homes of beings,—of intellectual beings like ourselves. But we suddenly receive a check if we turn our eye from the rigid facts of the case, when indulging in meditations that are, it must be admitted, most delightful to the mind in proportion as we are influenced by a poetical temperament. We receive, or we ought to receive, a check on the slightest discrepancy discovered here, suggesting either the absence of sufficient knowledge on our part, or the operation of some law, unknown to us, giving the particular facts we may be considering a new though not less glorious application.

Let us turn our telescopes to the moon. the body nearest the earth, and identified with it in many particulars not to be specified here, in more particulars, perhaps, than any other of the celestial bodies. But now we find, by the admission of almost all intelligent observers, that we cannot discover there a being circumstanced as man is known to be in the present life. The moon has no atmosphere; and even were that discovered, it would still surround a body torn asunder by earthquakes or constantly ravaged by volcanic fires, so as to be inoperative for the purposes to which it is subservient when encompassing the earth.

We return then upon our steps, and resuming our observations on the bodies revolving like our own in free space, we reach the general expression of the fact, that the earth being taken as the point of comparison, the masses moving with it round the sun, are more or less adapted to an existence like ours, in the degree of the distance of their respective orbits from us. But we have yet to determine the value of this generalization, and on reflection, we find, that in plainer terms it can only be made to signify, that in proportion as we leave the earth, supposing we have to clothe a mind like that of man with a material body shaped out of the elements around us, we should have to modify all the conditions entering into its composition. Or otherwise, we might state the case as follows: let us suppose we could bring together the beings we had created in the way described, for their respective spheres of action or enjoyment, they would be found, we affirm, always varying among themselves in most important particulars, according to their remove from our position, here nearer the sun and there outward into the wide sweep of an infinite space. The extreme points reached by our survey in either direction would require so many modifications as to indicate, beyond doubt, that our powers of analogy have altogether failed us.

Thus far we have supposed, when alluding to the bright objects in the heavens, there may be life analogous to that without which we could till very recently hardly conceive of the earth at all; but does it follow from the princi-

ple we are here considering that this is necessary, even though we concede the material arrangements to be in every other respect like those of our terrestrial home? By no means. The moon is, as was seen, at the best, a very doubtful illustration of the habitability theory; the other satellites are given up by the supporters of Sir D. B.'s hypothesis, and the condition of the sun itself must be regarded as incompatible with the terms of their argument; in other words suggesting the full value of the concessions made, the bodies attendant on worlds like our own little orb, various in number, beautiful in regularity of structure, and modified in wonderful ways, and the great Mass of matter around which both it and they, prime or subordinate as the case may be, are formed to revolve, must be excluded from the question of vitality, considered as embodied or illustrated in man. And even if these points were not called into question, we believe (notwithstanding the miserable conflict of opinions among the philosophers), we could adduce the earth itself as a witness in the matter, and compel it to afford a negative testimony. Here, indeed, is the value of the geological facts accumulated under our eye; for considering them, we cannot help seeing, that a body, the most adapted at present to our necessary uses, has been created and allowed to remain for periods indefinite to us, without being made to subserve the ends to which we destine all the superior planets, on the assumption they are peopled by beings like ourselves. Analogy would therefore say, that a body, or that any bodies conceivable in similar circumstances—although constituted of all the elements known to us, and for all the purposes of calling forth or sustaining life,—nay, for the development and education of mind itself, may have existed, and, consequently, may still exist, in which we are not authorized to expect the manifestations of a human intelligence.

And so in this unsatisfactory show of the case we are compelled to move on (the law of adaptation widening as we advance) till we approach the comets—which, although subserving perhaps more important purposes in the system than we have hitherto supposed, must fail us altogether when appealed to in this discussion, but not more so than the bodies never reached by them in their widest career of glory, when conducting us farther and farther, till we are lost in the indistinctness suggested by their vastness and immeasurable distance. Thus we are left among "lumps of light," or "star dust," or "world-matter in an incipient state," and can only find certainty enough to declare there is no room for dogmatical assertions respecting the conditions of the heavenly bodies, unless in every case, when falling back on our assumed knowledge of the earth, we beg the question as we advance, presuming indeed everything an excited disputant may be pleased to imagine.

We have said the "assumed knowledge" of the earth, because we think a metaphysician would confirm the suggestions of a cautious geologist as to the difficulty of reasoning even from the point we have taken all along as the foundation of our analogies. Do we know enough of the earth, a sceptic might inquire, and of our various relations to it, to constitute us the only standard of life, intelligence, and felicity? Of matter in its real nature, let us confess, we know nothing; of the laws of combination among its particles, or of attraction between its masses, but little more; while we are quite in the dark when speculating on its mode of influencing the intelligent mind. Of course we shall hazard no remarks here on the abstruse or transcendental questions concerning the origin of our ideas, or attempt to show, with some, the possibility of conceiving of more senses than those which at present hold us in connection with the external world. All we wish to suggest is, that while we can obtain so little satisfaction among the outlying bodies of the universe, we may discover at home, not only a means of explaining many of our failures in speculation, but of teaching the lesson of modesty, not permitting us again to squander our time and betray our folly in idle and unproductive reveries.

Had the question been simply, how may these heavenly bodies appear on the supposition that we apply to them a human intelligence or consciousness, we could entertain it on its own merits; or if we were invited to imagine ourselves led by a man educated to the extreme limit of our knowledge, through the various regions of the world, and striving to determine what report he could return respecting the works of God, or what analogies he might discern between his own residence in time and the glorious bodies he had investigated, we could find delight in disquisitions of the sort, however imaginative, and therefore stand prepared to admire the ingenuity picturing out for us the various possible phases of existence made apparent to such a mind. But here the case is very different: we have seen learned sophists not only sure of their conclusions respecting the most remote analogies drawn from the most uncertain facts, but red in the face with religious zeal; we have heard them blaspheme the sacred name of charity when insisting (or seeming to insist, for at times we can hardly credit their sincerity) that we must pronounce with as much certainty on the condition

and internal economy of the planets and fixed stars, and yet unresolved nebulæ, as on those of our own little earth. It is not unnecessary, therefore, for us to repeat, that all we really know may be summed up in few words. We are certain our world is the record of the Divine procedures in time; everywhere, above and below us, there is some indisputable reminiscence of wisdom and of goodness. We may conclude, moreover, that if the Hand to which we trace all the wonders referred to, would repeat itself, there will always be enough to quicken our intelligence and warrant our researches; but that when it chooses to modify its works, we must not presume on weak, much less on false analogies, but follow its indications, and patiently gather up its teachings till the law it would evolve is disclosed to us in its own indisputable light. In fact, we say again, of the earth we know but little; of some of the planets, less even than that; and of the stars and more distant objects of contemplation in the universe beyond, scarcely anything at all.

Nor, were we compelled to remain here, do we see anything to alarm our faith, or create the huge difficulties we are besought to remove from the path of the infidel man of science. Nay, the conviction of our own ignorance, and the feeling of reverence stealing over us when confounded by the majesty of the works of God, appear to us very nearly allied to the loftiest devotion very proper for us according to all the analogies we can institute. And we cannot help thinking, that if we could remove all doubts and obscurity, and place ourselves for a moment in the full effulgence of undisputed truths, the very growth of our souls would itself require before long the same sentiments of wonder and admiration we had just shaken off with so much labour. Men are formed, not to *comprehend*, but to *adore* the works of an Infinite Mind!

Well, then, just another glance at the theological bearings of the subject so largely treated in the books under review, though we might have disposed of them at once by the remark, that the mode of discussion adopted took them altogether out of our jurisdiction. And yet, if our readers will allow us to hazard thoughts of the kind, who, we might ask, will dare to affirm what God could or might do for a world situated as ours is found to be? He has blessed it —that is, he has adapted it for the use of an intelligent being. For our use He is still upholding it, amid the most extraordinary manifestations of providential care. We have only, then, to venture another step, and assume that He will interfere whenever His own wisdom may deem it necessary for our moral and spiritual welfare. Matter is subordinated, we have seen, to the higher interests of the mind, which, by the necessity of its nature, continually stretches toward the Infinite; but we have also concluded, that if in its widest expatiations it meet with the most astounding collocations of material forms, it will at once show its superiority to them by endeavouring to work them up into its own theories or speculations; or, failing there, fall back on the lofty thought illustrated in the preceding pages, that a world or an universe of worlds is as nothing before the Great First Cause, and that, consequently, no expression of his regard can be too lavish when he would indicate his presence to his creatures. Brought in this way once more to the point we occupied when following out the fact of adaptation in the physical analogies of the case, it would be impertinent to seek under what particular conditions the Divine favour might be recognised, and would leave us perhaps to expect the most unique display of his attributes of wisdom and mercy. In fact, this is all the Bible intimates concerning the Incarnation,—the doctrine which becomes, it would seem, the stumbling-stone of astronomical objectors, who, like Froude, declare they will never believe the Infinite could confine himself to our petty, and, in their sense, utterly contemptible, orb. The Scriptures merely state the fact, entering into no explanation whatever; but allowing both the mind and the heart of the believer to respond to its few simple notifications, that would even leave us to point out here how, in this particular, revealed agrees with natural religion, if indeed they be not the twofold expression of the same great principles.

But returning a little in our survey of the subject, we know we need not remain in the sublime vagueness which we have indicated as perchance necessary to the highest development of the mind. Where the physical facts are failing us, both reason and revelation indicate or suggest that the universe is filled with pure and lofty intelligences, of which, however, we can only say they are related to our earth. It is no absurdity to suppose they visit it, and even aid in working out the beneficial arrangements of its economy, or in giving effect to them in their highest application to the moral and spiritual education of its creatures:—

*'Αέρα ἐσσάμενοι, παντη φοιτωντες ἐπ' αἶαν,*
*Πλουτοδοτες.*

Now, if we might put questions based on analogies as strong as those we have hitherto considered, is man to assume, that, the existence of these high intelligences being granted, and their interest in the affairs of our mundane globe conceded, he is the

only creature whose eye may rest on, and whose heart may be affected by, the works of the Divine Parent? True, we know not—it would be vain to surmise—what body they may take, or through what instrumentality they can operate. Yet, laying down the principle that man—recovered, we mean, to the position he once occupied, and which the ideal of his nature really requires us to assume,—being only one link in the past chain of being, we can ascend (and why not descend?) and people immensity with the recipients of the Divine favour. The fact is, that once conceding the preceding facts as the ground of our reasoning, we might argue, that no mind, amid the innumerable minds of the universe, had a right to affirm it has exhausted, or even rightly conceived of, the original plan shaping or distributing the bodies around us, till it can determine all the references these may bear to all other intelligences. The ignorance, therefore, which, as was before said, we are compelled to confess, may be only the suggestion of a glorious truth like this; leaving us no necessity to amplify the present remarks on the supposition, that these same wonders in creation may bear a larger, and therefore their true relation to some higher condition of man himself, when the erring report of the senses shall be corrected, and the mind, taking a much wider survey, will not require to be guarded against the imperfection that will sometimes abuse true facts by founding upon them the most foolish surmises.

Now, on reconsideration, we are free to confess, that our report on the whole case is not very gratifying to the pride of science, falsely so called,—or very indicative of our advanced education in the proper use of the little we may really know or discover by our most assiduous studies. We are where we shall ever be found—in the pursuit of more enlarged views, and while, therefore, we can suggest to ourselves no plea for indolence or self-gratulation, there is every motive for progression, moral culture, and the devoutest application of the mind to the wonders around and above us.

Since, however, preaching or dehortation, is becoming the fashion among our philosophers, let us adopt the mode, and throw out a few remarks, which may be not an unprofitable method of suggesting the inferences to be drawn from the consideration of the entire subject. In using, then, the right of our position, and in so good society, we address ourselves in the first place to the simple-minded Truth-seeker. Recollect, we would say, that facts, and facts only, well observed and duly subordinated to each other, are the works of God, and that mere speculation is but a dream, or, worse, an arrogant reflection on the wisdom of the Creator. Let the intelligent artizan see to this—let the traveller and the geologist keep it before them—and, above all, let the astronomer write down every clear indication of it coming across his path and arresting his glance. The man who adds an unquestionable fact to the world's encyclopædia, is its real benefactor. Here is the foundation, and here are the materials for the superstructure too; and we may be quite sure that the Providence bringing these beneath our eye, will raise up the true philosophers who, giving them their proper place in our systems of knowledge, will do honour to them all by eschewing the fallacies of our forefathers.

To the Philosopher, we shall deem it no arrogance to say, engaged as we are from day to day in recording the result of his researches and the triumph of his calm intelligence over all external impediments, your very name implies not only the power of accumulating the facts alluded to above, but of teaching comparatively uninstructed men to employ them in working out the highest ends of their earthly lot, and at the same time in uniting themselves with all that is lofty and glorious in human destiny—

"Felices animæ, quibus hæc cognoscere primis
Inque domos superas scandere, cura fuit."

Your enemy is not the imagination (as necessary as the reason in its proper sphere of activity) simply considered, but that imagination broke loose from the common sense that should run through the most daring aspirations of a true science, and unbalanced therefore, by the facts which more humble men may have assisted to accumulate and preserve. If then it be the part of the wise to detect the importance of an observation, it is equally his dignity to evince the magnanimity, which will neither allow him to become the spoiled pet of public folly, nor the boastful defender of paradoxes terminating in his own profit or aggrandizement. If he deserve his name at all, he lives for the future rather than the present age!

To the Educator, whose character in a lower or higher sphere of influence we would honour beyond that of most men, and with all our heart, notwithstanding all we may have said when speaking about the deficiencies perceptible in our present academic arrangements, as judged of by the spirit of the books under review,—to the Educator we would hint the importance of adhering strictly, most strictly, to the principles of our Inductive Philosophy. Breaking away from formulæ of teaching that might have been adapted at one time to the monkish cell, and on the other hand avoiding the *nostra* administered to the young by our modern enthusiasts, let us endeavour to develop the mind through the senses—we

might say for the senses—through which we come into direct acquaintance with the works of God, so that every educated man may in himself be a fact of power, while he aids in augmenting the world's stock of available knowledge. Above all things, let us get rid of the petty sectarian bickerings of our day, and try to model the next generation on principles which shall confer both the facility of grasping a larger field of survey, and of gathering from it the influences ennobling character and illustrating the wise forethought of the Great Father respecting us.

Bringing our homily to bear on Divines, who spend their lives in composing, and delivering, and publishing things of the sort, and who must be supposed, therefore, the very best judges of the merit of "the humble attempt" to which they are now listening, perhaps with some impatience—we would say with all deference, but with all earnest sincerity, be not so afraid of the facts continually turning up in the realms of Nature. If we believe, let us act as if we felt there can be no contradiction between the thoughts, in the works, of God. On the one hand, do not be behind your age, when these facts are in the nursery-books of your children; and on the other, do not check the progress of science by identifying so much personal feeling with the views you do at length entertain, staking the hopes of men you teach on any fashionable philosophic theory you may chance to advocate, or deem consistent with revelation—which, of course, signifies your own particular religious creed. The Great Being, who would have us "feel after him" in Nature, and who has anticipated by his Word the spirit of all the discoveries that can be made by our honest endeavours to educate our moral powers in the presence of the glorious facts around us, would have us magnify His hand in the former by the high-minded magnanimity of true knowledge; and in the latter, by exemplifying our gratitude in Him by kind forbearance with each others' failings when engaged in the common effort of comprehending the vast schemes of His moral government.

To all, the question returns from digressions as wide as the revolutions of the planetary systems, and concentrates itself on the mind, and heart, and home of every man. Let each fill up his own sphere with the positive duties it may call for; here let him find the highest end to which we can put our knowledge of the earth and the heavens. Let us be just, and do good; intelligent and noble-hearted; the disseminators of truth, and the abhorrers of all that is showy in mere pretence, and tricky when appealing to the lower natures of men for ignoble personal ends.

And, in fine, if we have to meet our authors again, whose writings we have considered in no hostile spirit, although with the determination of expressing all our opinions most freely, we sincerely trust we shall gain some positive advantage from their lucubrations, and not have to conclude, and therefore to say, that we believe they have obstructed the path of truth, impeded the advance of science, and even done damage to the interests of a true religion, which we must hope, after all, they hold seriously at heart, and for which they are prepared to make all conceivable sacrifices when uninfluenced by the spirit of the ardent partizan.

## ON THE MEANS OF AVOIDING SMOKE FROM BOILER FURNACES.

A PAPER on the above subject was read at the Institution of Civil Engineers, on Tuesday evening, November 14, by Mr. W. Woodcock, the patentee of the smoke-preventing furnace recently described in our pages.

The author commenced by explaining the nature of smoke as existing in furnaces, the cause of its formation, its component gases, and the temperature at which they became inflammable, and then pointed out a method of preventing the evolution of opaque smoke by simple and apparently effective means. It was stated that ordinary pit coal, under the process of destructive distillation, gave off various volatile substances, some of which were gases, such as hydrogen, marsh gas, olefiant gas, carbonic oxide, &c.; these and others existed in the furnace only in a gaseous state, becoming liquid or solid when in the external air, and of such coal tar was composed; and amidst them the carbon, in minute subdivision, was held in suspension, giving to the smoke its sable hue. All these gases were combustible at given temperatures, provided a certain amount of oxygen was present. It was then contended that the air containing this oxygen, if imparted to the gases after leaving the fuel on the bars, must be administered so as not to reduce the temperature of the gases below their "flame points." The arguments on the chemical composition of smoke were enforced by extracts from a letter by Mr. Mansfield, published in the *Mechanics' Magazine*,* in which the subject was fully investigated.

The formation of smoke, or visible carbon held in suspension, was stated to depend entirely upon the insufficiency of the supply of oxygen in the furnace, as the heat of the furnace would cause the various gases to be given off more rapidly than their combus-

* *Vide Mech. Mag.* Oct. 14, 1854, page 365.

tion could be supported by the quantity of oxygen passing through the fire-bars in the same period of time—this evil being much aggravated by the heat of the air as usually supplied from the ordinary ash-pit, generally ranging from 200° to 800° Fahr., and the air at that heat containing less oxygen by about one-third than at the usual atmospheric temperature, and consequently that the combustion of the fuel to which it was supplied, must be one-third less perfect.

The simplest means of preventing the formation of smoke, were said to be obtained by providing for an ample supply of oxygen in a condensed state, in the form of cold air, to the fuel on the fire-bars, and by administering such further supply of oxygen to the heated gases as might be necessary for their complete combustion whilst in contact with the boiler; this latter supply being given at such a temperature as would insure the successive ignition of the gases as they were evolved. Thus by establishing nearly perfect primary combustion, the quantity of smoke evolved was to be reduced to a minimum, of which no visible trace ever reached the summit of the chimney.

A description of the apparatus by which this desirable end was attained having been already laid before our readers, it is unnecessary for us to repeat the author's account of it.

## WOODCOCK'S SMOKELESS FURNACE.

*To the Editor of the Mechanics' Magazine.*

SIR,—I beg to postpone my remarks on Mr. Mansfield's advocacy of Mr. Woodcock's furnace, as that gentleman has taken the case into his own hands (see his letter, inserted in your last week's number). The main point on which he now relies is, the assumed fact (but which is no fact) that the air is "highly heated" by passing through two tubes placed within the furnace. That the 100,000 cubic feet of cold air, required for the gas of each ton of coals, should be highly and instantaneously heated in passing through two tubes, of about 4 feet long, would be indeed a miracle. Compare this with the enormous fires, and enormous length of tubes by which the air is heated in the furnaces in the iron-works, and the utter absurdity of the assumption becomes manifest.

It happens, however, that my last letter, on the very point, stands in juxtaposition with Mr. Woodcock's, and I think it will be considered conclusive in dispelling this fiction of the hot air.

Of the success which Mr. Woodcock alleges attends the use of his apparatus, I can have no doubt; although I differ entirely from him as to the cause, which I assert arises solely and exclusively from his adoption of the plan, principle, and apparatus of my expired patent of 1839. Mr. Woodcock says, to the doubting, "Visit and inspect my invention in full play, at Mr. Meux's brewery." Now, that is just what I have been saying during the last fourteen years. I have induced hundreds of persons to inspect the furnaces, fitted with my diffusion plates, from the very first, put up in 1840, at the Liverpool Water-works, to the very last, on board the *Llewellyn*, Holyhead mail steamer (see my treatise, page 114).

I have induced many also to inspect the furnace put up by Mr. Dewrance, at the railway station in this town, where also may be seen the "inverted bridge" claimed by Mr. Woodcock. Hundreds have also, during the last ten years, inspected the furnace at the Dublin Steam Company's Works, in which the whole processes of combustion may be advantageously seen and studied; every part of the interior being visible while in action; and in which may be seen the smoke made to appear or disappear, as it were, by word of command, merely by opening or shutting the passage by which the cold air is introduced to the gases.

Mr. Woodcock says, "It is not *ex necessitate* to the thirty years' experience of Mr. Williams that success should be granted." Certainly not. It is, however, granted to the practical application, during the last fourteen years, of the mode of bringing the gas and air together for effecting their mixture, and as now adopted by Mr. Woodcock.

"Mr. Williams's work is well known to me," Mr. Woodcock observes; "but his theory, or more properly, hypothesis, precedes, and does not follow his induction." These are mere words, at once unintelligible and incorrect, inasmuch as I have broached no new "*theory;*" while my "*induction*" is simply this, that as the principle of the Argand gas-burner was available in the lamp, and as the operations of nature are always uniform, I considered it should be equally available in the furnace; and this I have demonstrated. Until, then, Mr. Woodcock points out what theory, hypothesis, or induction he attributes to me, his statement must be considered as unwarranted. Mr. Woodcock may have opened my treatise, but he cannot be familiar with its chemical or practical details, or he would not, I am certain, have so misrepresented them, or have fallen into so many errors, both in practice and theory, as he has done, and as Mr. Mansfield has done, as will hereafter be noticed.

Mr. Woodcock says, "Cold air is but a partial, and is not, and cannot be, a total cure for smoke, and does not cause a combustion of every particle of smoke." No,

nor of even a single particle, smoke being absolutely incombustible. What is meant by "a total cure for smoke," he must, however, explain. The application of my apparatus, though it may not be "a cure for smoke," effects what is much better, and what we all want—it effects the combustion of the gas in the furnace, without allowing the formation of "a single particle" of smoke. In a word, as is done in the Argand burner, it causes a perfect instead of an imperfect combustion of the gas generated within the furnace.

Mr. Woodcock goes on to say, "Mr. Williams, inconsistently enough, claims my plan of applying hot air." I at once repudiate any such inconsistency or claim; and I call on him for proof of his assertion. What I do claim is, the mode of introducing the cold (not hot) air, in a divided state (as water is divided by passing through the rose of a watering-pot), by numerous perforations, or divisions, and just as the gas is brought to the air in the Argand burner. To put this, the all-important point, beyond dispute, I here add some extracts from the specification of my patent of 1839, which was revised and settled by no less an authority than Dr. Ure. See his "Dictionary of Art," last edition, under the heads "Evaporation" and "Smoke Prevention."

Extracts, viz.:

"Hitherto attention has not been paid to the chemical conditions of the formation of smoke, and the distinction which exists between the *volatile* and the *fixed* constituents of coal, and the peculiarities of their respective modes of combustion. Smoke is the result of the imperfect combustion of the volatile products, and the consequent change of the carbon, from the colourless state of gaseous combination into a black pulverulent form. The carburetted hydrogen gases require, as the condition of their combustion, that they be intimately blended with an appropriate volume of air.

"Again: as one cubic foot of this gas requires two cubic feet of oxygen (or ten of atmospheric air), these volumes must be so intimately blended as to bring the particles of the combustible gas and the air within the sphere of their reciprocal chemical attraction. Now, in ordinary furnaces the air cannot reach the gas that escapes into the flues, except by passing through the highly-ignited fuel on the bars. The unignited gaseous mixture, in travelling through the flues, loses temperature very fast, and deposits the eliminated carbon in the form of sooty smoke.

"The construction of my furnace supplies each process with the means necessary to its completion, and in their proper order, viz.:

"1st. The generation of the gas from each charge of fresh fuel by the heat from the preceding charges, then in a state of incandescence.

"2nd. The supplying such gas with the oxygen necessary to perfect chemical union and combustion, and in a manner more favourable to their *instantaneous and complete intermixture.*

"3rd. The effecting this incorporation of the gas and air, before the mixture has passed into the flues, beyond the influences of the high temperature essential to ignition.

"4th. The supplying the air from a source independent of the current in the ash-pit. Having thus described the nature of my invention, I do not claim the introduction of the air to the bridge, which has already been done by others (Parkes, for instance); but I specially and exclusively claim, as my invention,

"1st. The use, construction, and application of the *perforated air-distributors*, by which the air is more immediately and intimately blended with the combustible gases in the furnace.

"2nd. The application of distinct tubes, by which the air is conducted to the gases at the bridge and flame-bed, in *whatever situation they may be placed*, where such tubes are the means of bringing such air to the gas, independently of the air in the ash-pit."

Now, Sir, I will not doubt the candour and fairness of Mr. Woodcock himself, in admitting that the meaning and express terms of this specification are identical with that part of his furnace which has relation to the admission of the air.

I am, Sir, yours, &c.,
C. W. Williams.

Liverpool, Nov. 20, 1854.

## MODERN ANTIQUES — RETROGRADE PROGRESS OF INVENTION.

*To the Editor of the Mechanics' Magazine.*

Sir,—At page 351 of your present volume I stated my inability to discover the slightest novelty in the "improvement in pumps" patented by Messrs. Marsden.* Your correspondent, Mr. Brown, in your last number (page 470), fancies the supposed novelty may consist in "the feed and ejection waterways being cast with the platform plate on which the forcing cylinders and air-vessel are bolted;" an arrangement which he (Mr. Brown) had used four-

* No. 480. *Vide* abstract of specification, p. 395.

teen years ago, but fortunately "did not think worth patenting." I say fortunately, because *second* inventors, or those who follow *them*, have no right. I used this arrangement myself upwards of thirty years since, but its first introduction dates long before the birth of any of your present contributors or readers, unless they be centenarians.

In the best modern fire-engine, that of Hadley, Simpkin, and Lott, patented in 1792, the feed and ejection waterways were cast with the platform plate, at that time a novelty only as used in conjunction with separate valve-chambers, clear of the working barrels, an improvement which Messrs. Marsden do not affect.

At the close of the 17th century there lived—and for a time flourished—an engineer named Fowke, who manufactured pumps and fire-engines on an extensive scale, but was ultimately eclipsed by a rival manufacturer, named Newsham, whose fire-engines (the subject of two patents) were so generally preferred, that they were supplied to the royal palaces and government establishments, and were also largely purchased by the insurance companies, London and country parishes, and public institutions. The distinguishing feature of Fowke's fire-engine, like the Dutch and German engines, of which it was, to some extent, a copy, consisted in the handles for working it being placed at the *end* of the engines; whence they were called scale-beam engines. Many such engines still exist in various parts of the metropolis: there is a very good and powerful one at the British Museum.

The Canadian fire-engine, in the Exhibition of 1851, was a fine specimen of the scale-beam engine. One of Newsham's improvements consisted in working his engines by handles placed at the *side* instead of at the *end*.

I have now before me the specification of T. W. Cross, of Leeds, pail-manufacturer, for his patent for "a portable fire-engine."* This invention is stated to consist "in a novel or improved arrangement of the parts of a fire-engine, and in a simple or less complicated mode of working the pumps than in ordinary fire-engines;" and the result it said to be the production of "an engine that will *perform as much work* as an ordinary engine with *less labour*." The drawings and description show the *arrangement* of the pumps and air-vessel to be an inferior copy of Newsham's, with Fowke's mode of working them, except that Fowke never committed so great an absurdity as to mount his pump-lever upon a single fulcrum, nor did he ever limit the handle-space of a six-inch engine to four men. Fowke's fire-engine of 1700 was indeed, in every respect, much superior to Cross's of 1853. Newsham claimed the merit of greatly improving upon the arrangement of his rival. "The staves," says Newsham in his circular,* "that are fixed through the levers along the *sides* of the engine for the men to work by, though very light, as alternate motions with quick returns require, yet will not spring and lose time the least; but the staves of such engines as are wrought at the *end* of the cisterns will spring or break if they be of such a length as is necessary for a large engine when a considerable power is applied, and cannot be fixed fast, because they cannot at all times be taken out before that engine can go through a passage." This objection was to some extent remedied by making the long handles to fold up to the width of the cistern. Mr. Cross obviates it by limiting the length of the handles to the width of the engine.

The benighted editor of the *Leeds Times*, in a highly eulogistic notice of the fire-engine *invented* and patented by Mr. Cross, says, "The engine is worked by persons standing at either *end* of it, instead of the *side*, as in the ordinary fire-engines; whereby, as may readily be conceived (?), great additional power is obtained, owing to *the increased length of the leverage*." The intelligent editor of the *Leeds Intelligencer* also writes, "We have not had an opportunity of seeing the engines, but a competent judge says, 'I think it a considerable improvement on the old fire-engines, great leverage force being obtained by placing the handles or bars *along* instead of *across* the engine' (this is a mistake in the terms), so that the men working it stand at the *ends* instead of the *sides*." The power of the lever, the weight and pressure of the atmosphere and of water, are all regulated by well known and unalterable laws, which must inevitably control the efficiency of any engine involving their operation. Your readers will therefore be not a little surprised to learn that the "*great leverage force*" thus boasted of is only about 3½ to 1; while in "the old engines," having the disadvantage of side handles, it varies from 4 and even 5 to 1. The leverage of the London brigade fire-engines is 4½ to 1. In the old engines, with 6-inch barrels, the handles are 10 feet long and upwards; in Mr. Cross's only about 2 feet. Mr. Cross's patent was granted for "a *portable* fire-engine." In his specification he describes

* No. 557, March 5th, 1853. *Vide* specification, vol. lix., page 230.

* Printed in "Switzer's System of Hydrostatics," 1729.

and claims a *powerful* one also. One of the claims made is "for mounting a fire-engine in a plain, shallow, oblong box, open at top, and arranged to hold all the apparatus of a *powerful* fire-engine." Have not similar engines been so mounted time out of mind? Would an *ornamental*, *deep*, *square*, *open box* be deemed any infringement?

Anything like a fire-engine, less *portable* than that of Mr. Cross, has seldom been constructed since that made at Nuremberg by Hautsch, in 1656, which was mounted upon a sledge only. The four largest size fire-engines of the first English makers before referred to, were mounted upon wheels; the two smaller sizes were portable, being carried by short handles, like a sedan chair. Mr. Cross, in his specification, says, "The water may be poured into the box (cistern) by buckets; and for this purpose I claim the right of supplying Cross's or the American bucket."

This celebrated pail-maker's fire-engine is to be seen in the Crystal Palace; and I fancy the conclusion come to by most "competent judges" will be, that the pails are the best of it. "Cobbler, stick to your last."

Messrs. Marsden have evidently improved upon Mr. Cross, although not yet "up to the mark." Are we beginning a new cycle of inventions? And are all the improvements of the last century to form the subjects of successive patents in the present?

I remain, Sir, yours, &c.,

W. Baddeley.

13, Angell-terrace, Islington, Nov. 13, 1854.

## ON ELECTRO-MAGNETS.

*To the Editor of the Mechanics' Magazine.*

Sir,—At page 372 of your present volume I mentioned three points in relation to electro-magnetism, the knowledge of which appears to me to have an important bearing on its practical applications. The first of them is, the influence of the position and space occupied by the coil or coils on the effective working of an electro-magnet. In order to avoid preconceived notions, and to render the data on which I proceed as unexceptionable as the nature of the case admits, I purpose to bring before the notice of your readers a series of experiments made many years ago, which, although they had not the benefit of the application of batteries practically constant in their operation, are still amply sufficient to determine the question which we have in hand.

It is well known that, after the discovery of the method of making temporary magnets of soft iron under the influence of electric currents, was discovered, a very powerful magnet of this description was constructed by Professor Henry, of Albany; and it is also satisfactory to know that he has placed on record facts relating to it, which, although at that time exceedingly interesting as mere facts, will now be acknowledged to have a very important influence upon the practical application of this remarkable property of soft iron.*

The magnet consisted of a bar of soft iron, two inches square and 20 inches long, bent into the form of a horse-shoe; the extremities or poles were ground truly flat, and furnished with an armature of soft iron, also ground flat, so that it might adapt itself, as closely as possible, to the surface of the poles. The horse-shoe bar was wound round with 540 feet of covered copper wire, in nine coils of 60 feet each; the precaution was taken to mark the ends of each coil respectively, so that the effect of each coil, when traversed by an electric current, might be observed separately, or any number be united for observation.

The battery was the ordinary copper cup used at that period for these purposes, and the zinc surface in action amounted to $\frac{2}{5}$ths of a square foot, or 57$\frac{3}{5}$ square inches. The following results were obtained:

| No. of Wires soldered to the battery in succession. | | Weight lifted in lbs. avoirdupois. |
|---|---|---|
| 1. | Each soldered to the battery in succession | 7 |
| 2. | One on each side of the arch | 145 |
| 2. | One from each end of the legs | 200 |
| 3. | One from each end of the legs, the other from the middle of the arch | 300 |
| 4. | Two from each end | 507 |
| 6. | Wires attached | 570 |
| 9. | All the wires attached | 650 |

* Abstracted from Sir David Brewster's Treatise on Magnetism, in the 7th edition of the *Encyclopædia Britannica*, published in a separate form by Messrs. Black, of Edinburgh. P. 308, and sequel.

In making use of the foregoing table, we shall not allude to the first series of experiments; for the result is so peculiar as to lead us to suppose that the armature was applied to only one of the extremities at each experiment; in fact, that the circle of polarity was incomplete. We shall also exclude the fourth experiment, as the conditions are dissimilar, involving the introduction of the central coil; but from the remaining numbers of the series we may deduce important directions as to the construction of electro-magnets.

Thus we see, that when one coil from each extremity was brought into action, 200 lbs. were held by the armature; when two coils on each side were connected with the battery, 507 lbs. Now if the generally assumed opinion were correct, that the power of an electro-magnet is great in proportion to the amount of wire with which it is covered, each pair of additional coils should impart to the magnet an increment of 397 lbs.. and the whole nine coils should enable it to sustain a weight of 1,497 lbs. instead of 650 lbs., or more than double that weight. In examining the results more minutely, we see in fact that even the third pair of coils only gives an increment of 63 lbs., and the remaining three coils an increment of only 80 lbs.

It is therefore clear that, in order to develope the maximum power of an electro-magnet at a minimum cost, the bar of soft iron should only be wound over about $\frac{2}{3}$ths of the length of each pole, measured from its extremity.

Professor Henry further states, that on substituting a battery exposing 144 square inches of zinc surface for the former one of $57\frac{1}{2}$ square inches, he obtained an attractive power of 750 lbs. when all the wires were attached; and that when a pair of plates, exactly *one square inch*, was employed, the magnet suspended 85 lbs. These are apparently anomalous results, which deserve to be considered, and which, with your permission, I will endeavour in some measure to do in a future number of your Journal, when considering the influence of disturbing forces.

Apologising for taking up so much space,
I am, Sir, yours, &c.,
George Kemp,
M.D. Cantab.

Guernsey, Oct. 28, 1854.

## WHEEL-CUTTING.

*To the Editor of the Mechanics' Magazine.*

Sir, — Your correspondent, Monsieur Cherbonneau, has made a mistake in correcting what he states to be an error in my instructions to a "Wheel-cutter" for cutting a wheel with 735 teeth. I said the locking-wheel should have 49 teeth, 48 of which should be turned round at each tooth cut; to prove the correctness of which, suppose the wheel to be turned entirely round at each locking, a wheel of 720 teeth would be produced, and $720 \times 49 = 35,280$, the number of teeth passed in completing the circumvolution of his dividing plate. Now, if instead of using the entire 49 teeth, only 48 be passed at each locking, it will require 735 successive lockings, and consequently teeth cut, to complete the circumvolution of the plate, for $735 \times 48 = 35,280$, the same number as before.

Now, let us test the 48 toothed wheel of Monsieur Cherbonneau.

$$720 \times 48 = 34,560$$
$$735 \times 47 = 34,545;$$

consequently he will find he has cut 735 teeth before completing the circle.

If a "Wheel-cutter" has not already done so, let him follow my first instructions, and he will cut his wheel correctly.

I am, Sir, yours, &c.,
Edward J. Powell.

Admiralty, Nov. 20, 1854.

*To the Editor of the Mechanics' Magazine.*

Sir,—I see by your last number that Monsieur Cherbonneau has returned to the subject of wheel-cutting; and as I had in my former letter advised the use of 49 teeth for cutting a wheel of 735 teeth, I beg to tell that gentleman that he is misleading a "Wheel-cutter;" for, if the latter use a plate of 48, he will produce a wheel of 720 teeth only. Now, as I before stated, if he use a plate of 49 notches, and take 24 of these notches for every time a space is cut, and so proceed to the end, he will find he has but 735 teeth. I suppose Monsieur Cherbonneau will allow there will be as many teeth as there are spaces cut, and it will be seen that by using a plate of 49, and moving 24 for every space cut, he will have gained 1 tooth on every 48 cut; in other words, he will gain a notch on the plate for every revolution, because after the first two moves, he will begin to count on the 49th notch, after four moves on the 48th, then on the 47th, and so on to the end; he will then have gained 15 teeth over and above 720, making 735, the number required.

It is a pity that persons who do not themselves know the way, should set themselves up to instruct strangers, and draw them from the right path pointed out by others.

There is much credit due to Mr. Powell for the exceedingly simple and efficient method pointed out by him.

I advise R. Cherbonneau to study "Derham's Artificial Clockmaker;" Thiout's work, vol. i. p. 53; article "Graduation," in vol. 10, page 352, of "Edinburgh Cyclopædia;" Paper in "Philosophical Transactions" of 1785, by Smeaton; Allan's method in "Transactions of Society of Arts," vol. 34, 1816; "Smith's Mechanics," two vols. 8vo; or "Reid's Treatise," 1849.

I hope "Wheel-cutter" will have the kindness to make us acquainted with the method and process used by him, when his wheel is completed.

I am, Sir, yours, &c.,
S. LONG.

Putney, Nov. 18, 1854.

## M'CORMICK'S REAPER.

[The following letter bears so explicit a testimony to the merits of Mr. M'Cormick's reaper, that we think it deserves to be made public.]

West Blanime, by Dunse, Nov. 7, 1854.

SIR,—Previous to receiving Mr. M'Keinzie's note, I had made up my mind to let you know how your reaper succeeded last harvest. It gives me much pleasure to say that it has given me complete satisfaction, and I am now satisfied that it will not be easily beaten. By its aid I cut twenty-five acres of wheat, and ten acres of black oats, both very heavy crops, and partially laid, in a very superior manner, without stoppage from breakage. The reason of my having cut so small a proportion with yours this year is, that having got one of Crosskill's Bell's, I used it chiefly, as I wished to give it a fair trial. Having done so, I have no hesitation in saying yours is the best, for the following reasons:—It is easier for the horses. It will cut a great deal more corn in a day. It is much easier taken up, doing at least one-third more and much cleaner. It can cross the ridges, while the other cannot. It is not liable to break or go out of order, nor is it liable to choke either with damp corn or clover. I may state, that the whole of my people prefer your reaper, not excepting the man who rakes the corn off; he does not find the work much severer than with the other, if any.

I may also add, that I cut with your reaper about ten acres a day; eight men or women and four boys take up, bind, and stack twelve acres in a day of ten hours. Last, year as I formerly mentioned, I cut eighteen acres of wheat in twelve hours; the field was level, the crop not laid, though pretty strong.

I have no hesitation in saying, that were your reapers known, they would be more generally used, as they deserve to be.

I remain, Sir, yours, etc.,
ARCHIBALD DALGLEISH.

Mr. M'Cormick, London.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in revolving fire-arms.* (A communication. Patent dated April 27, 1854. (No. 955.)

This invention consists of the application and use in fire-arms having revolving charge-chambers, of a breech-piece, formed with a channel for the introduction of the charges into the chambers, such breech-piece being provided with a filling-up piece to close the channel when necessary: and of the application and use in fire-arms fitted with a loading channel in the breech-piece of a sliding rod, held in place by a spring, for clearing the charge-chambers through the loading channel when necessary, &c.

JOHNSON, JOHN HENRY, of Lincoln's-fields, Middlesex, gentleman. *Improvements in polishing and flattening metal plates.* (A communication.) Patent dated April 27, 1854. (No. 956.)

"The plates to be flattened are first polished on a flat bed, fitted with sliding clamps to fix it during the polishing process. The polished plates, or a pair of them, are then freed entirely from dust, and placed back to back between a pair of polished steel pressing plates or blocks, the surfaces of which are well freed from dust, and the whole is enclosed in a frame fitted with a hinge, and tightened by means of a screw-pin. The necessary pressure is obtained from a pair of pressing rollers or other pressing mechanism."

CLARKE, HENRY, of Lincoln. *Improvements in fire-arms and ordnance.* Patent dated April 27, 1854. (No. 958.)

*Claim.*—The employment of a series of barrels, placed side by side, in connection with a cylinder revolving horizontally, in which the breeches are bored.

BARLING, JOSEPH, of High-street, Maidstone, Kent. *Improvements in treating the hop-bine, and rendering it applicable to the manufacture of paper and other articles.* Patent dated April 27, 1854. (No. 960.)

This invention consists in making the bine or stalk of the hop plant into material for paper or board requiring to be bleached, by cutting, crushing, tearing, and boiling it, and dissolving and discharging the mucilaginous or gummy matter.

GIBSON, ANDREW WHITE, of Edinburgh, Scotland, miller. *Improvements in mills for the manufacture of barley and rice.* Patent dated April 28, 1854. (No. 962.)

This invention has for its object the substitution of a mechanical mode of supplying the material to be operated upon, and removing or discharging it from the mill after the operation, for the ordinary hand process. It is intended, by means of such arrangement, combined with suitable mechanism for carrying on the ordinary operations on the material, to reduce the whole process to one uniform mechanical mode of operation, uninterrupted by any intervening operation on the part of an attendant.

EVANS, JOHN, of Abbots Langley, Hertford, paper-manufacturer. *A new manufacture of paper.* Patent dated April 28, 1854. (No. 964.)

The inventor collects the refuse, waste, or clippings which arise from the manufacture of Brazilian grass into plait or plaited hats, and subjects this material to nearly the same treatment as has heretofore been employed in the manufacture of paper from hemp or flax waste.

HEYWOOD, JAMES, of Ratcliffe-bridge, Lancaster, dyer. *Improvements in machinery or apparatus for printing yarns.* Patent dated April 28, 1854. (No. 965.)

This invention relates to printing in the "hank" such yarns as are required to be partially printed, leaving intermediate spaces blank, so as to be subsequently employed in manufacturing clouded or speckled goods or fabrics. Any convenient number of hanks of yarn are to be distended endwise, by passing them over two side-rods or rails placed in a suitable framework for holding them, so that they may present a flat horizontal surface, capable of being printed upon when placed side by side.

DIXON, BENJAMIN, of Birmingham, Warwick, schoolmaster. *An improvement or improvements in the joints of measuring-rules.* Patent dated April 29, 1854. (No. 967.)

This invention consists in forming rule-joints from sheet metal, cut and bent as required, instead of from plates of cast or unbent sheet metal, as is usually practised.

KINGSFORD, CHRISTOPHER, of Buckingham-street, Strand, Middlesex, civil engineer. *Improvements in solidifying or indurating peat, soft, small, or pulverized coal, and other substances of a like oleaginous or bituminous nature, and machinery and apparatus for effecting the same.* Patent dated April 29, 1854. (No. 969.)

This invention comprises certain improvements in mills or crushers for grinding or pulverizing peat, coal, and other similar substances to be used in conjunction with a sifting process, whereby the finer particles are extracted during the operation; also certain machinery or apparatus for drying or heating ground substances in a heated chamber, whereby a radiated heat is thrown upon the material without the risk of ignition, and the air, gases, or vapours are partially withdrawn during the process, &c.

PORTER, JOSEPH, of Salford, Lancaster, engineer, and RICHARD HOWSON, of Manchester, same county, engineer. *Improvements in forge-hammers.* Patent dated May 1, 1854. (No. 970.)

In constructing a forge-hammer with their improvements, the inventors adjust the hammer-head in vertical guides, so that it may rise and fall in them, and cause it to be raised by means of a toothed wheel or segment and corresponding rack, and allow it to fall, partly by its own weight and partly by means of atmospheric pressure obtained through the medium of a vacuum cylinder.

BRIGGS, EDWARD, of Castleton Mills, near Rochdale, Lancaster, manufacturer, and WILLIAM SOUTER, of the same place, manager. *Improvements in treating and preparing silk, and in machinery connected therewith.* Patent dated May 1, 1854. (No. 971.)

This invention consists in subjecting raw or partially-manufactured silk to a bath formed of a weak solution of sulphuric or other suitable acid, and in constructing various arrangements of machinery for preparing waste cocoons, "husks," "knubs," and other silk waste, and rendering the same fit for subsequent operations.

WADDINGTON, WILLIAM ALFRED, of Stonegate, York, pianoforte-maker. *Certain improvements in the construction of sounding-boards for pianofortes and other like stringed instruments.* Patent dated May 1, 1854. (No. 972.)

This invention consists of a novel arrangement of the ribs for strengthening the sounding-board, which ribs the inventor proposes to place on the front of the sounding-board, instead of the back.

ARCHBALD, WILLIAM AUGUSTUS, of Stanhope-street, Gloucester-gate, Middlesex, gentleman. *Improvements in the manufacture of concrete cane-juice, and sugar.* Patent dated May 1, 1854. (No. 973.)

This invention consists—1. In reducing boiled cane-juice or other saccharine matter into concrete, for the purpose of combining the sugar and molasses or syrup into a hard mass. 2. In placing the same on a sheet, or on any other convenient object, for the purpose of facilitating its withdrawal from the vessel in which it has been hardened. 3. In regulating the temperature to which that article should be concentrated. 4. In drying the concrete in the sun, or in a warm atmosphere. 5. In the employment of con-

crete (produced by means of agitation during the cooling of the boiled saccharine juice) in the manufacture of sugar, or other manufacture in which saccharine matters are employed, &c.

MACFARLANE, WALTER, of Glasgow, Lanark, engineer. *Improvements in water-closets, lavatories, dust-bins, and public and domestic conveniences.* Patent dated May 1, 1854. (No. 974.)

In arranging conveniences for public use, —as for streets, markets, and factories—according to this invention, a single independent structure is made to comprehend a complete suit, including water-closets, lavatories, urinals, dust-bins, and a fresh-water supply for drinking. The building is preferred to be octagonal in plan, being composed of cast-iron pillars, panelled between, with slightly relieved ornamental iron plates fitting into grooves, and supporting an entablature and roof, and surmounted by an ornamentally-panelled water-cistern bearing terminal fountains. The specification describes the details of the various parts.

FENTON, JAMES, of Low Moor, Bradford, York, civil engineer. *Improvements in safety-valves.* Patent dated May 1, 1854. (No. 975.)

This invention is of so important a character, that we purpose describing it at length shortly.

HAMILTON, JAMES, of New York, United States. *Improvements in machinery for crushing quartz and other substances.* Patent dated May 1, 1854. (No. 976.)

*Claim.*—Certain means for cracking and grinding metallic ores or other substances, consisting of a cylindrical pestle set on a shaft, on which it has a partial rotary motion, in combination with a basin in which it moves.

CLARKE, JOHN, of Leicester. *Improvements in knitting machinery.* Patent dated May 1, 1854. (No. 978.)

This invention has for its object improvements in the machinery used in knitting stockings and other hosiery, and consists of a peculiar combination of parts whereby the article of hosiery, as it is made, may be gradually narrowed by tickling points, the work being progressively made narrower by means of the thread carriers (or such of them as are for the time being working to produce the narrower parts) being made to pass over a continually less number of needles.

JACKSON, THOMAS, of Commercial-road, Pimlico, Middlesex, contractor for public works. *Improvements in the manufacture of paper from flax, hemp, jute, Indian grass, and other fibrous vegetable substances, or the tow produced from such fibrous substances.* Patent dated May 2, 1854. (No. 979.)

The inventor breaks or scutches the substance mentioned, cuts it into suitable lengths, immerses it in a solution of caustic alkali, submits it to mechanical pressure, according to Pownall's patent of July 15, 1852, and then subjects it to a bath of acidulated water. The fibre is then ready for being bleached, either by the direct action of chlorine gas, or by a solution of hypochlorite of lime, as employed in the bleaching of yarns for weaving purposes. If the solution of hypochlorite of lime be adopted, the inventor takes the fibre while moist with the acid from the last operation, and places it in a vat fitted with a false bottom and discharge-cock, wetting each layer with a bleaching solution of requisite strength till a sufficient quantity of fibre and solution have thus been placed together in the vat. The discharge-cock is then opened, and the bleaching solution being caught in a proper receptacle, is ladled over the top of the fibrous mass by a workman, and the circulation is continued till the fibres are perfectly white. By this mode of applying the bleaching compound fresh particles are continually brought in contact with the material to be bleached, and the result is a more complete and rapid accomplishment of the end desired. A stream of pure soft water is now allowed to percolate through the mass of bleached fibre to remove the soluble salt formed during the bleaching; and this having been effected, acidulated water, of the same description as before, is employed to remove any slight remains of the chloro-compound, which might be injurious were it allowed to remain in the fibre. A final percolation of water through the fibre is effected, and the material is then fit for the pulping machine.

HUTTON, WILLIAM, of Portland-town, St. John's-wood, Middlesex, builder. *An improved machine for the manufacture of bricks.* Patent dated May 2, 1854. (No. 980.)

This invention consists in combining together certain mechanism so as to constitute a brick-making machine, and more particularly in the making of the bottom of the pug-mill with sloping channels and boxes, "by which the clay is discharged from the mill with considerably less power than if the bottom were not sloping."

MAYER, JOSEPH, of Burslem, Stafford, manufacturer, and JOHN DAVID KIND, of Birmingham, Warwick, manufacturer. *An improvement or improvements in attaching door-plates, letters, and figures made of glass, porcelain, earthenware, or other vitreous or semi-vitreous substance to doors and such other surfaces as the same may be required to be attached to.* Patent dated May 2, 1854. (No. 981.)

The object of this invention is effected by causing springs, studs, or wedges, fixed on the door or surface, to engage in slots in the back of the letter or figure, or by causing springs, studs, or wedges fixed on the back of the letter or figure to engage in slots in the door, or in a plate attached to it.

TRUEMAN, ALFRED, of Swansea, Glamorgan. *Improvements in the manufacture of sulphuric acid when roasting copper ores, and also when burning sulphur or iron pyrites.* Patent dated May 2, 1854. (No. 982.)

*Claims.*—1. The application in suitable apparatus of platinum or oxides in combination with ovens or furnaces wherein copper ores are roasted, in order to convert the sulphurous acid gas derived from the roasting process into sulphuric acid; and, 2. The application of platinum, and also of oxides combined with pumice-stone, or porous matters, in the manufacture of sulphuric acid.

WALLER, RICHARD, of Leeds, York, gentleman. *Improvements in valves applicable to steam engines and other purposes, and in apparatus connected with the same.* Patent dated May 2, 1854. (No. 983.)

"This invention relates," says the inventor, "to the peculiar construction and arrangement of the valve, by which I reduce very materially the pressure of the steam on it by covering it closely with a moveable valve box with arms or projections, which box is supported by, and moves backwards and forwards on rollers, covering the valve with it. This motion of the rollers diminishes the friction caused by the sliding action as heretofore generally adopted. The valve is pierced or opened entirely to the required dimensions of the steam ports, leaving such surface to be acted upon by the pressure resulting only on the exhaust side of the valve, which serves to keep the valve in contact with the surface of the face-plate in the steam chest."

MINASI, CARLO, of Brecknock-place, Camden-town, Middlesex, professor of music. *Improvements in apparatus for hatching eggs, and for raising or rearing the young when first produced.* Patent dated May 2, 1854. (No. 985.)

A full description of this invention has appeared in our pages. *See* vol. lxi. pages 110, 417.

MARYON, ROBERT JAMES, of York-road, Lambeth, Surrey, gentleman. *Certain improvements in the construction of, and manufacture of anchors.* Patent dated May 2, 1854. (No. 986.)

The following is a portion of what Mr. Maryon says in his specification. "I do so construct my fluke or flukes various—firstly, I project a plan of constructing of the flukes of anchors with an arch or arc joint (similar to a mechanic's two-foot rule arch joint), viz., at the swivel pin of the well-known Porter's swivel compound lever anchor, whereby this said principle of my said projection will safely secure to vessels or ships a perfect and simple safety means of carrying, or of suspending their anchors." It is not easy to discover the gist of this invention from the specification.

PLISSON, DÉSIRÉ, of Paris, France. *Certain improvements in chemical condensing apparatus.* Patent dated May 2, 1854. (No. 988.)

These improvements consist—1. In applying a syphon nozzle to bottles used for condensing chemical substances, such as nitric acid. This nozzle consists of a bent tube fixed to the bottom of the bottle, and having an opening near it; it rises in the bottle to a few inches in height, and then emerges from it with a short bend, which terminating above the level of the opening in the tube, does not allow the condensed fluid in the bottle to sink below a certain level. The efflux of the fluid is thus made continuous and unattended with any loss of gas. 2. In so connecting or arranging the bottles used for the purpose as to form a condensing circuit in a small space. 3. In a new kind of chemical bottle-necks and communication tubes or pipes, intended to improve the luting, &c.

BISHOP, BENJAMIN, and JOSEPH DYER, of Birmingham, Warwick. *Improvements in the manufacture of stop-butts and other hinges.* Patent dated May 2, 1854. (No. 990.)

This invention consists in forming hinges of sheet iron or brass, and in constructing certain machinery for manufacturing the same.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in lathes for turning wood and other materials.* (A communication.) Patent dated May 3, 1854. (No. 992.)

These improvements consist in the employment of a slide rest, fitted with a number of suitable cutting tools, which are made to operate on the material to be turned by means of intermediate levers, which follow the configurations of fixed metallic guides or templates.

RICHARDS, WILLIAM WESTLEY, of Birmingham, Warwick, gun-manufacturer. *An improvement or improvements in loading certain kinds of fire-arms.* Patent dated May 3, 1854. (No. 993.)

This invention consists in forcing bullets or projectiles into the barrels of repeating or revolving fire-arms, by means of a ramrod, to which a sliding motion is given by a rack and pinion.

RASCOL, EUGÈNE HIPPOLYTE, of Catherine-street, Strand, Middlesex. *An im-*

*proved connection for driving straps, bands, or belts.* (A communication.) Patent dated May 3, 1854. (No. 995.)

This improved connection consists of a small hoop, of a rectangular form, of such size as will encircle the two ends of the strap when placed with their broadsides in close contact. The two ends of a strap so placed are both pushed through the hoop together in the same direction; and having been projected about an inch, a wedge is introduced between the ends.

POOLE, MOSES, of the Avenue-road, Regent's-park, Middlesex. *Improvements in paving or covering the surfaces of roads, streets, or ways.* (A communication.) Patent dated May 3, 1854. (No. 996.)

This invention consists in laying down a metallic cellular framing, the interstices of which are filled up with a suitable material.

BARLOW, EDWARD, of Bolton-le-Moors, Lancaster, machine-maker, WILLIAM JOHNSON, of Farnworth, in the same county, manager, and WILLIAM SLATER and PETER KNOWLES, both of Bolton-le-Moors, aforesaid, overlookers. *Improvements in machinery for preparing and spinning cotton and other fibrous materials.* Patent dated May 4, 1854. (No. 999.)

This invention consists—1. In the application to blowers, scutchers, or openers, of a perforated plate, covered with doors or slides, which plate is placed between the beater and the exhausting cage, or in any other convenient position, so as to admit air when requisite for distributing the fibrous material in a uniform fleece. 2. In an improved construction of bearings, suitable for the axles of beaters or of card cylinders, or of other axles of machines used in preparing and spinning fibrous materials. 3. In the application to carding engines of boxes or cages in which a partial vacuum is formed, for the purpose of removing the dust or other light impurities, which are separated from the fibrous material during the operation of carding, &c.

BARLOW, CHARLES, of Chancery-lane. *Improvements in meters for accurately measuring water and other fluids discharged from pipes, sluices, or vessels.* (A communication.) Patent dated May 4, 1854. (No. 1000.)

*Claim.* — Combining with a cylindrical case, provided with induction and eduction passages, and with a segmental stop and leather cap plate for packing, a series of segmental pistons, hinged to arms projecting from a central shaft hub, and hinged at about one-third of the distance from their inner ends, so that when thrown open their outer ends shall not bind against the inner periphery of the cylinder, and when closed to pass the segmental stop, they shall be sustained by a rest projecting from the central shaft or its equivalent, having a space between them and the shaft and arms, for the free flow of water or other fluid under the said pistons, to admit of their closing freely.

NASMYTH, JAMES, of Patricroft, near Manchester, Lancaster, engineer. *An improvement in the process of puddling iron.* Patent dated May 4, 1854. (No. 1001.)

"In carrying out this invention," says Mr. Nasmyth, "I subject the molten cast iron in the puddling or refining furnace to the action of a current or currents of steam, introduced as nearly as practicable to the lowest portion of the molten iron and thence diffused upwards, so as not only mechanically to agitate the molten iron, and thereby keep exposing fresh surfaces of the iron to the oxygen contained in the atmosphere passing through the furnace, but also when brought into contact with the incandescent iron to be reduced to its elements and yield oxygen, which will chemically combine with the carbon of the iron as well as with the sulphur or other oxidizable substances of the iron with which it may come into contact and have affinity, and thereby deprive the iron of those impurities, whilst the other component of the steam simultaneously liberated, namely, hydrogen, is free to combine with any sulphur present in the furnace, whether as an ingredient in the iron, or as a product of combustion of the fuel employed for heating the iron, and thus substances very prejudicial to the quality of the iron will be removed or prevented from combining therewith, whilst at the same time the operation will be materially expedited."

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GOUCHER, JOHN, of Worksop, Nottingham, machine-manufacturer and iron-founder. *Improvements in propelling ships and other vessels.* Application dated April 25, 1854. (No. 950.)

These improvements consist in the employment of two or more pairs of expanding and contracting submerged propellers placed at the ship's sides, or in any other convenient position. Each of the propellers is composed of a vertical shaft or axis supported on and capable of turning about a horizontal axis, and having one or two pairs of flaps or wings connected thereto by hinge or other joints, which will admit of the flaps or wings moving about their point of attachment through a space equal to about the fourth part of a circle, so as to expand or open out by the resistance of the water to their motion during the propelling stroke,

and collapse or come together during the reverse stroke. Both or all the vertical shafts on one side of a ship are connected together, so as to move simultaneously, and they receive a reciprocating motion about their horizontal axes in any convenient manner from a steam engine or other source of power. To reverse the motion of the vessel, the shafts of the propellers are furnished with universal joints, or are otherwise fitted so as to admit of their being turned round at their points of support, and thus cause the propelling action to be exerted in the opposite direction. Levers, or other arrangements, are fitted to the vertical shafts for the purpose of turning them.

PERSON, CHARLES CLÉOPHAS, Knight of the Legion of Honour, of Paris, France. *Certain improvements in coating with zinc by galvanization.* Application dated April 27, 1854. (No. 951.)

"This process," says the inventor, "which may be termed 'voltaic zincage by help of alumina,' is founded upon the intercession or use of alumina in the electrolytic bath—that is, the alumina acts as a medium, and facilitates the reduction of the zinc to a great extent."

OWEN, THOMAS GRIFFITH, of Shrubland-road, Dalston, Middlesex, architect. *An improved construction of portable filter.* Application dated April 27, 1854. (No. 953.)

The object of this invention is to provide a means of filtering the water used by soldiers during a campaign. For this purpose the inventor constructs a peculiar form of bucket (designated the cavalry bucket), which is arranged so as to filter water, &c.

GRAVATT, WILLIAM, of Park-street, Westminster, civil engineer. *An improvement in propelling ships and other vessels.* Application dated April 27, 1854. (No. 954.)

This invention has reference to propelling vessels by the ejection of water therefrom, and consists in drawing or in admitting water into the vessel, and in bringing it to, or causing it to assume, a state of rest, or nearly so, with regard to the vessel, and then, by means of pistons, pumps, or other mechanical contrivances so acting upon the water so introduced, and forcibly ejecting it, or raising it to a head sufficient to forcibly eject it from the vessel, at a velocity which, when the vessel is at her working speed, is about equal to or greater than the speed of the vessel through the water.

FARMER, SIR GEORGE RICHARD, baronet, of Bideford, Devon. *Improvements in safety-valves for steam boilers.* Application dated April 27, 1854. (No. 957.)

The improved safety apparatus consists—1. Of three distinct and separate valves of different sizes, one of which acts as a relief-valve; they are placed in a single plate of metal, screwed or riveted on to the boiler. 2. Of their rods or stalks. 3. Of two upright side posts. 4. Of three cross rails; and 5. Of an inverted cylindrical dish and piston, placed at the safety level of the water in the boiler. The stalks work through the three cross rails, inserted into suitable uprights or posts outside the valve. The lower cross rail is tenoned at each end, to allow it to work vertically in a mortise made for this purpose in the side posts.

GREEN, RICHARD, of Sydney-street, Brompton, Middlesex. *Improvements in propelling vessels.* Application dated April 27, 1854. (No. 959.)

This invention consists in the employment of a submerged wheel (working horizontally by preference), on which are placed blades or arms, which, during one-half only of the revolution of the wheel, are turned so that they present their flat surfaces to the water.

WOODBRIDGE, FREDERICK, of Green's-terrace, Lower-road, Rotherhithe, Surrey. *Improvements in furnaces.* Application dated April 27, 1854. (No. 961.)

This invention consists in arranging the fire-bars of a furnace in such manner that the fuel may be agitated from time to time, in order that it may be moved towards the back of the furnace as it is consumed.

TIZARD, WILLIAM LITTELL, of Aldgate, London, engineer. *Certain apparatus for roasting and calcining ores and minerals, and separating metals therefrom, which apparatus is in whole or in part applicable to the drying and roasting of malt and other vegetable substances.* Application dated April 28, 1854. (No. 963.)

The inventor's specification describes an apparatus which is mainly intended to surmount the difficulty experienced in extracting gold from ores containing a superfluity of antimony, arsenic, lead, tin, or other metals, the presence of which prevent amalgamation.

DIX, ALEXANDER MILLS, of Salford, Lancaster, brewer. *Improvements in apparatus for regulating or governing the supply or pressure of gas as it is conducted from the main to the burners.* Application dated April 29, 1854. (No. 966.)

This apparatus consists principally of two small inverted vessels or chambers, one of which is enclosed by a vessel through which the gas passes, and, acting upon the upper surface of the vessel, causes it to be depressed or elevated, according to the variableness of the pressure of the gas, and thus to work the regulating valve.

VARLET, JEAN PHILIPPE, mechanic, of Paris, France. *Improvements in obstructing the holes produced by accidents or projectiles*

*in the hulls of ships and boats.* Application dated April 29, 1854. (No. 968.)

The inventor constructs a flexible case or shell of waterproof cloth, caoutchouc, gutta percha, or other waterproof substance, which is to be passed under the damaged ship or boat, and drawn up by ropes or otherwise, so as to envelope the hull of the vessel, and prevent the entrance of water at the holes.

PALMER, WILLIAM RUSSELL, of New York, United States. *Improvements in the construction of spike threshing machines, whereby all liability to and danger of accident in their use is removed and prevented, and by which the grain is cleaned from chaff, smut, &c., at the same time it is being threshed.* Application dated May 1, 1854. (No. 977.)

This invention consists in so constructing the cylinder that it is rendered secure against the liability of bursting; in so inserting the spikes in it that they will not be thrown out by centrifugal force; in so constructing the feed-board or hopper that all foreign substances which may be in the grain shall be separated therefrom, and discharged from the machine without being carried into it; and in placing a guard or roller before the cylinder, which shall prevent any foreign bodies from being drawn or carried into the thresher, and at the same time intercept the spikes, or any other matter, when thrown forward by means of the revolutions of the cylinder.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in moulding, preparing, and finishing articles and fabrics made of compounds of caoutchouc, gutta percha, and other substances.* (A communication.) Application dated May 2, 1854. (No. 984).

This invention relates chiefly to moulding articles of various kinds in a hard compound of caoutchouc, gutta percha, and other substances, and has for its object to so far support or protect the article that it may not be put out of shape by the after process of finishing.

DIÉ, GUILLAUME, of Paris, France. *Certain improvements in the manufacture of tracing cloths and tracing paper.* Application dated May 2, 1854. (No. 987.)

The object of the inventor is to manufacture tracing paper of unusual transparency and impermeability. For this purpose he employs the following substances:—lavender essence, 129 parts; gum copal, 264 parts; spermaceti, 65 parts; stearine, 31 parts; boiled linseed or siccative oil, 58 parts; Venetian turpentine, 129 parts; solution of gutta percha in carbonic essence, 107 parts; litharge, 22 parts; common turpentine, 130 parts; carbonate of soda, 65 parts.

MAIN, THOMAS, of Glasgow, Lanark, engineer. *Improvements in steam engines.* Application dated May 3, 1854. (No. 991.)

In carrying out this invention the two steam cylinders of a double engine, such as would be suitable for actuating a screw propeller, are each set at or about an angle of 45° with the vertical line, their lower ends being towards each other. A triangular bracket or brackets with a ridge upwards, and running in a line coincident with the keel line of the ship, carries the two cylinders, which are held down or steadied from their several points; the object being to obtain compact engines for running at a high speed.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in grinding mills.* (A communication.) Application dated May 3, 1854. (No. 994.)

The grinding mill described by the inventor is composed of an upper shell which is grooved inside, and of a cone which, being more obtuse than the shell, leaves within the latter a space lessening downwards, so as to grind with continually increasing fineness. A cross rail, moveable by means of set bolts, is employed, and by it the distances between the grinding cone and its shell are regulated.

KNAPP, WILLIAM HYDE, of Cross-street, Islington. *Improvements in the manufacture of hats and bonnets.* Application dated May 3, 1854. (No. 997.)

These improvements consist in employing soft felted bodies, or bodies such as are used or are suitable for being covered with silk, and in applying to them cement and flock, by which means hats and bonnets having the appearance of being napless are produced.

MEE, CORNELIA, of Bath, Somerset. *An improved foundation for working out ornamental designs or patterns.* Application dated May 4, 1854. (No. 998.)

The inventor proposes to print on paper or other suitable material a series of squares of any size, but so arranged that every square shall break joint (horizontally or vertically) with the others. On this foundation ornamental designs of any description may be drawn or shaded, and covered with variously-coloured bead work or any other suitable material.

STEWARD, HENRY, of Baker-street, Bedford-square, Middlesex. *A pocket protector and pocket.* Application dated May 5, 1854. (No. 1003.)

This invention consists mainly in applying springs, catches, slides, &c., to pockets.

BARBETTE, ANTOINE MARIE PHILIBERT, of Paris, France, brass-founder. *Improvements in the manufacture of brass-topped nails.* Application dated May 5, 1854. (No. 1008.)

This invention consists in sinking small-headed iron wire points into sand moulds prepared for casting suitable discs regularly disposed in straight lines on both sides of a casting groove in the sand. The upper part of the mould being set fast on the under part, and the small-headed wire points sunk at their respective places, the molten metal is allowed to flow into the prepared spaces.

*** The documents of No. 989 are with the law-officers, under objection.

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## PROVISIONAL PROTECTIONS.

*Dated September* 4, 1854.

1936. Jacques François Henry Hypolite Hervé de Lavaur, of Paris, France, gentleman. Certain improvements in securing waterproof wrappers or coverings used in packing goods.

*Dated September* 8, 1854.

1959. Samuel Frearson, of Glascote, Warwick, gentleman. Improvements in the construction and manufacture of buttons, a part or parts of which improvements may also be applied to other similar purposes. A communication.

*Dated October* 8, 1854.

2118. William Tatham, of Rochdale, Lancaster, machine-maker. Improvements in machinery or apparatus for preparing, spinning, doubling, twisting, and winding cotton, wool, flax, silk, and other fibrous substances.

*Dated October* 10, 1854.

2167. Joseph Burdekin Jackson, of Etna Works, Sheffield, York, and William Bowler, also of Sheffield, engineers. Improvements in furnaces or fire-places, and in the prevention of smoke.

*Dated October* 14, 1854.

2203. Louisa Monzani, of Greyhound-place, Old Kent-road, Surrey, widow, and administratrix of Willoughby Theobald Monzani, late of St. James's-terrace, Bermondsey, Surrey, gentleman, deceased. An improvement in brushes and brooms. This is the same invention as that for which letters patent were granted to her late husband, 20th June, 1854.

*Dated October* 31, 1854.

2310. Thomas Frederick Tyerman, of Weymouth-street, Portland-place, Middlesex, architect and surveyor. Improvements in preparing hoop iron and such like metal surfaces used for bondings in buildings and structures.

2314. Thomas Prosser, of New York, United States of America, but now of Birkenhead, Chester, merchant and civil engineer. Improvements in condensers of steam engines and parts connected therewith.

2316. Archibald Craig, of Paisley, Renfrew, engineer. Improvements in the manufacture of railway wheels.

2318. Thomas Osborne, of Leicester, engineer, and William Eldred, of the same place, railway contractor. Improvements in apparatus for retarding and stopping railway carriages.

*Dated November* 1, 1854.

2320. James and William Bradshaw, of Blackburn, Lancaster, watchmakers. Improvements in time-pieces.

2322. James Birsch Robb, of Boston, United States of America, counsellor-at-law. Improvements in brakes or retarding apparatus.

2324. Henry Brinton, junior, of Kidderminster, Worcester, carpet manufacturer, and Richard Smith Weaver, of the same place. Improvements in the manufacture of carpets, hearth-rugs, and other like fabrics.

*Dated November* 2, 1854.

2326. John Gedge, of Wellington-street, Middlesex. Improvements in machinery or apparatus for grinding. A communication from Auguste and Alphonse St. Denis, of Bastia, Corsica.

2328. Loring D. Dewey, of New York, United States of America, now resident in London. Protection against fire in vessels or buildings by putting out the fire without personal aid, or with very little, and against incendiary or fraudulent fires and ravages of vermin. He is the true inventor of it in part, and proprietor of the whole.

*Dated November* 3, 1854.

2332. Nathaniel Topp, of Farnworth, Lancaster, spinner, John Holt, of the same place, spinner, and John Partington, of the same place, mechanic. Improvements in hand mules for spinning.

2334. Edouard Alexandre, organ-builder, of Paris. Improvements in organ pianos.

2336. William Charles Theodore Schaeffer, of Stanhope-terrace, Hyde-park-gardens, analytical chemist. Improvements in treating the waste washwaters of woollen and other mills.

*Dated November* 4, 1854.

2338. John Adcock, of Marlborough-road, Dalston, Middlesex, cigar manufacturer. The novel application of the stem or stalk of the tobacco leaf for various useful purposes.

*Dated November* 6, 1854.

2340. Hyppolite Bordier, banker, of Orleans, France. Making alcohol or spirit from different plants and vegetable productions of a farinaceous nature.

2342. John Shaw, of Dukinfield, Chester, machine-maker. Improvements in guns and fire-arms.

2344. Frederic Rainford Ensor, of the Park, Nottingham. Improvements in bobbin net or twist lace machinery.

2346. William Childs the younger, of Brighton, Sussex, manufacturer. An improvement in the manufacture of pipes and tubes.

2348. Frank James Wilson Packman, of Puckeridge, Herts, doctor of medicine. A method of compressing air in air-guns, and an improved air-gun.

*Dated November* 7, 1854.

2352. Edward Hogg, of Charles-street, Gateshead, Durham, engineer. Improvements in shot and shell.

2354. William Henry Woodhouse, of Parliament-street, Westminster, civil engineer. An improved meter for water and other liquids.

2356. Edward Simons, of Birmingham, Warwick, manufacturer. A new or improved candlestick.

2358. John Bird, of Chance's fire-brick works, near Dudley. Improvements in reverberatory furnaces.

2360. John Blaikie, of Glasgow, Lanark, machinist. Improvements in the manufacture of driving belts, straps, and bands for machinery.

*Dated November* 8, 1854.

2362. Leone Glukman, of Sackville-street, Dublin, professor of natural philosophy. Improvements in effecting electric communications in railway trains.

2364. James Whitehead, of Patricroft, Lancaster,

spinner. Certain improvements in self-acting mules.

2366. Charles William Siemens, of John-street, Adelphi, Middlesex, civil engineer. Improvements in electric telegraphs. A communication.

2368. William Edmund Newton, of Chancery-lane, Middlesex, civil engineer. An improved mode of constructing saws. A communication.

2372. Charles Dalrymple Cranstoun, of Elgin, Moray, gentleman. Improvements in coupling and uncoupling railway carriages and rolling stock.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," November* 21*st*, 1854.)

1537. Thomas Bennett Foulkes. Improvements in the manufacture of self-adjusting gloves.

1579. Peter Cato. An improved manger or trough for holding the provender of horses, cattle, and other animals.

1586. James Longley. A machine for turning and finishing tubs, pails, casks, and other wooden vessels of an elliptic, oval, or other eccentric form.

1593. George Jackson. Certain improvements in the construction of tents.

1606. Nicholas Callan. A means by which iron of every kind may be protected against the action of the weather, and of various corroding substances, so that iron thus protected will answer for roofing for cisterns, baths, gutters, window-frames, telegraphic wires, for marine and various other purposes, and by which brass and copper may be similarly protected.

1620. Edward Francis Hutchins. Constructing the cylinders of engines worked by steam, air, or other fluid body in a circular form, on plan, by which means more power is obtained from a given quantity of the said fluid body in cases where a circular motion is required than by any other known form of cylinder.

1741. William White. An improvement in deodorizing the contents of cesspools, privies, and also like matters in other places.

1814. William Ker and Matthew Ker. An improvement in the frames of expanding tables.

1834. Thomas Miller. Improvements in apparatus for raising coals and other weights from the holds of ships and other places.

1894. Pierre Amable de Saint Simon Sicard. Improvements in apparatus for raising and destroying submerged vessels, rocks, and other bodies, and also in apparatus to facilitate the examination of submerged bodies.

1959. Samuel Frearson. Improvements in the construction and manufacture of buttons, a part or parts of which improvements may also be applied to other similar purposes. A communication.

2080. Frederick Clark. An improved spindle and bush for door-knobs and other similar uses.

2167. Joseph Burdekin Jackson and William Bowler. Improvements in furnaces or fire-places, and in the prevention of smoke.

2181. William White. Improvements in the manufacture of manures.

2206. William John Bisseker. A new and improved and durable method of labelling bottles and such like vessels or articles as require or may require labelling.

2295. Jabez Morgan. Improvements in machinery or apparatus for cutting metals.

2299. Charles Blake. A method of preventing or lessening the injurious effects arising from collisions at sea and on other navigable waters.

2310. Thomas Frederick Tyerman. Improvements in preparing hoop iron and such like metal surfaces used for bondings in buildings and structures.

2311. William Reid. Improvements in the manufacture of galvanic batteries.

2323. Alfred Vincent Newton. An improved method of forging or swaging railroad carriage and other wheels. A communication.

2360. John Blaikie. Improvements in the manufacture of driving belts, straps, and bands for machinery.

2368. William Edward Newton. An improved mode of constructing saws. A communication.

2372. Charles Dalrymple Cranstoun. Improvements in coupling and uncoupling railway carriages and rolling stock.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed November* 17, 1854.

899. Moses Poole.
1140. Robert Oram and William Oram.
1141. Charles Bostock and Stephen Greenwood.
1148. Ernst Radigon and Raimond Gabriel De Grimouville.
1223. Charles Maschwitz.

*Sealed November* 21, 1854.

1144. Frederick Jenks and Thos. Brown.
1152. John Lawson.
1159. Thomas Clarendon and Owen John Gilsen.
1161. Josiah George Jennings and Robert Davenport.
1165. Edward Everall and Thos. Jones.
1169. John Packham.
1177. James Lord.
1191. Joseph Ridsdale.
1222. Thomas Greenshields.
1232. Peter Armand Lecomte de Fontainemoreau.
1256. David Atkinson.
1330. George Mears.
1381. David Clovis Knab.
1398. Joseph Davies.
1415. Richard Leicester Antrobus.
1544. Robert James Maryon.
1551. James Derham.
1554. Elijah Henry Brindley.
1594. Joseph Barnes.
1756. Thomas Lawrence.
1850. Theodore Schwann.
1853. Matthew Curtis, William Henry Rhodes, and John Wain.
1872. John Gedge.
1950. George Printy Wheeler and Samuel Bromhead.
1994. Henry Crosley.

2005. George Frederick Evans and Frederick John Evans.
2012. John Ashworth.
2013. Nathan Thompson, junior.
2044. John Henry Johnson.
2071. The Hon. James Sinclair.
2090. Moses Poole.
2104. George Fergusson Wilson and George Payne.
2114. John Penn.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*Trevanion.*—We are not able to decide upon the qualities of such a gun-boat as you describe: but we think India-rubber might be employed as you suggest with advantage. It is certain, however, that experiments on a large scale would require to be performed before the method could be put in practice.

*E. B.*, Leeds, asks what is the best method of connecting several electro-magnets? "I am aware," he says, "that for a single magnet, some prefer a continuous wire, and some a number of wires. But suppose three or four single-wire electro-magnets are to be connected, would it be preferable to unite them in a continuous line, or to to divide the current among them all, in order to obtain the greatest and most equal result? An answer to the above would greatly oblige," &c. The best method of connecting the magnets depends upon the battery employed; if that be formed for *intensity*, it would be preferable to unite the wires in a continuous line; but if for *quantity*, the current should be divided among them all. It may be remarked, however, that the battery should be made to suit the magnet or the work to be performed, not the magnet the battery. Thus, if the magnet be large, and contain a large mass of metal, or if it be a compound magnet having several poles, for the purpose of producing a large force, then it is better to divide the circuit among a number of wires, making the battery a quantity one; but if the magnet be small, or if it is for telegraphic purposes, through a long circuit, then the wire should be continuous, and the battery, of course, one of intensity.

*A Mechanic*, of Darlington, sends us the following curious "problem."—"Required the reason, and under what law, the moon makes but one revolution on her axis during the period of her revolution round the earth?" The *reason* rests with the Almighty; the observed *law* is not a general one. There is no law, that we know of, connecting the rotations of satellites round their axes with their revolutions in their orbits, analogous to that by which the periods and distances of the planets are regulated, viz.,

$$D^3 \propto P^2.$$

*A Constant Subscriber.*—We are not able to answer you in the present number.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

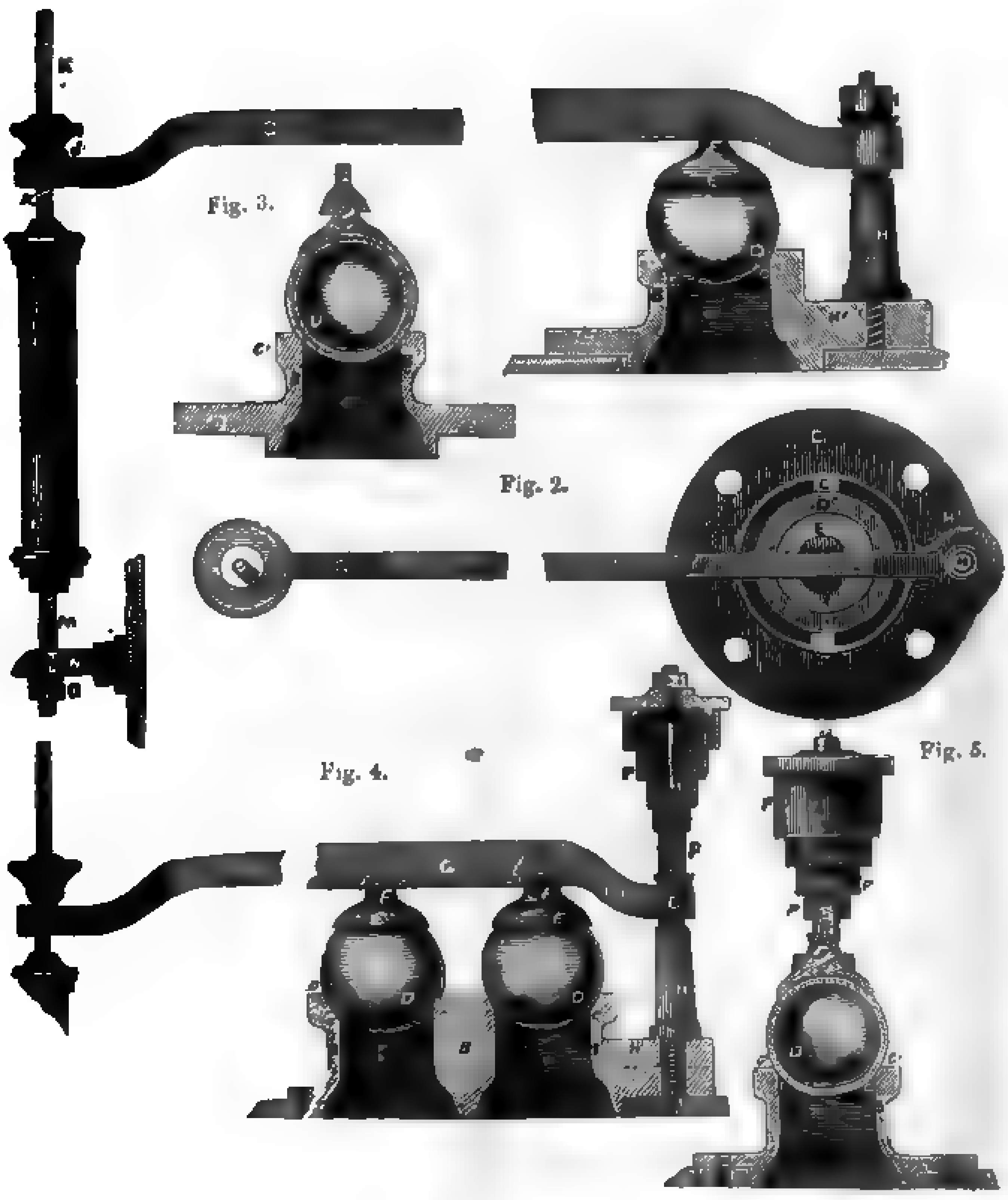
# Mechanics' Magazine.

No. 1634.] SATURDAY, DECEMBER 2, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## FENTON'S PATENT IMPROVEMENTS IN SAFETY-VALVES.

Fig. 1.



# FENTON'S PATENT IMPROVEMENTS IN SAFETY-VALVES.

(Patent dated May 1, 1854.)

We have much pleasure in bringing, this week, before our readers, an invention of unusual merit,—one which, if brought into general use, is calculated we believe to put an end to boiler explosions for the future, so far, at least, as a safety-valve, perfect in its action, can conduce to such a result. The public is indebted for the improvement to Mr. J. Fenton, of Low Moor. As it is quite unnecessary for us to write one word to engineers and others concerning the utility of a safety-valve which cannot possibly be obstructed in its action, either accidentally or designedly, we shall proceed at once to describe the nature of his arrangement.

Mr. Fenton's invention consists of two parts:—*First*. In forming and fitting a single valve in an improved manner; and, *Second*. In combining two of the improved valves together in a certain manner, to be described hereafter. It is to the latter of these that our preceding remarks chiefly apply. It will be necessary, however, to present the two in their proper order.

The first part comprises the following arrangements:—The valve itself, which is of the form of a sphere, rests upon a spherical seat, and is provided with cup and ball fittings to the lever and appendages. A cup rests immediately over the sphere in connection with a lever, in which it is held by a spindle. One end of the lever is held upon a vertical spindle. The nut by which it is secured is spherical at its lower end, and fits into a corresponding cup on the upper side of the lever. The long arm of the lever is provided with a like fitting, by which it is connected to the spindle of a spring balance, while the lower end of the spring balance spindle is connected by a similar fitting to a rod or arm projecting from the boiler. The object of these fittings is to allow of play at every joint. And in order further to prevent any part of this valve from sticking, care is taken that the parts which come in contact in forming the joints shall not be of the same metal.

In the engravings in the preceding page is shown the manner in which the improved single safety valve is constructed, and also modifications of it adapted to locomotive and marine steam boilers. Fig. 1 is an elevation, with the valve seat in section, of a locomotive safety-valve; fig. 2 a plan; and fig. 3 a cross section. A A is a portion of the boiler plate. B B is the valve seat casing, which is cast in brass or gun metal, and bolted to the boiler by the flange, C C. *c c* is the valve seat, which is formed out of a circular edge, turned and ground to fit accurately the valve, D. The upper part of the valve seat is dished out in the manner represented by the dotted lines in fig. 1, in order that directly the valve is lifted from its seat by the pressure of the steam, there may be sufficient space for the steam to blow off freely. C′ C′ are four guides to insure the valve falling accurately into its seat. The valve, D, is cast hollow, as indicated in fig. 3, and afterwards turned perfectly spherical, or as nearly so as possible. E is a cup or cap cast concave, and ground to fit the upper part of the valve, D. F is a projection or spindle cast in a piece with the cup, and formed with a semicircular end, which fits into a corresponding semicircular cup in the under side of the lever, G. H is a vertical spindle, the lower end of which is screwed into a snug, H′, cast upon the valve seat casing. The upper part of this spindle is also cut with a screw thread, upon which is fitted the nut, I, the underside of which is made spherical, and fits into a corresponding cup formed in the upper part of the lever, G, a conical hole being drilled through the lever at this part, so as to enable it to be passed over the end of the vertical spindle, and retained there by the nut, I, which thereby acts as a fulcrum to the lever. The opposite end of the lever is furnished with a similar nut and hole, J, through which the screwed end of the spindle, K, of an ordinary spring balance, L, is passed, the lower end of the box of the balance being fitted with a screwed spindle, M, which is passed through the rod or arm, N, and fitted with a nut, O. The lever, G, is curved down at each end, as shown in fig. 1, in order to bring the centres of the spherical nuts in the same line with the central line of the lever, and thereby to render the action of the valve more accurate and certain.

We are now in a position to describe the second and most important part of the invention. This consists in combining two of the valves just described in such manner that when any action takes place, either intentionally or otherwise, the tendency of which is to overweight the valve, one of the two immediately becomes a fulcrum, about which the other is raised. The value of this simple but perfectly efficient arrangement cannot be estimated too highly.

Figs. 4 and 5 represent the two valves, each constructed in precisely the same manner as the foregoing. P is a volute spring placed between the nut, I, and the end of the lever,

G, which acts either as a fulcrum or as a weight to the lever, according to the adjustment of the spring balance; for should the spring balance be screwed down or weighted to resist a greater pressure than the volute spring, then the volute would become compressed when the steam blew off through the valves; but should the volute be screwed down to an excess of pressure over the spring balance, then the volute would act as a fulcrum to the lever, and the spring balance would become lifted.

We sincerely trust that this arrangement will soon become so generally adopted, as to put an end to the disasters arising from boiler explosions, which are found to produce on an average, at least one death daily in this country alone.

The inventor also employs a safety-valve adapted for either stationary or marine boilers, in which he employs a pair of volute springs acting directly upon the top of the valve, and thereby dispenses with the lever and spring balance.

## ON PRODUCTS OBTAINED FROM COAL.

BY PROFESSOR CRACE CALVERT, F.C.S., ETC.*

The accompanying table will give an idea of the numerous products which chemists had ascertained to exist in the substances distilled from coal;

| GASES. | LIQUIDS. |
|---|---|
| Bicarburetted hydrogen. | Bisulphuret of carbon. |
| Propyline. | Ammonia. |
| Light carburetted hydrogen. | Eupion. |
| Hydrogen. | Paraffine oil. |
| Oxide of carbon. | Aniline. |
| Sulphuretted hydrogen. | Leukol. |
| | Carbonic acid. |
| | Benzine. |
| | Napthine. |
| | Napthole. |

SOLIDS.

| | |
|---|---|
| Napthaline. | Para Napthaline. |
| Paraffine. | Pyrene. |
| Chrysene. | |

It will be perceived from this Table that the products obtained from coals were divisible into three classes, namely, gases, liquids, and solids. He did not intend to dwell upon the first class, the gases, which subject was so extensive that it would require to be treated in a separate paper. With respect to the solid products of coal, he would first allude to the coke which was obtained in making gas.

The coke generally obtained from gas works was very inferior. Great efforts had lately been made to obtain the various products of coal, and also to manufacture good coke for cupola and railway purposes, at the works of the London Gas Company; but he was not aware of the exact results obtained.

The liquid products from coal could be divided into two distinct classes, the aqueous portion and the tarry portion. The aqueous portion was valuable chiefly for the ammonia which it contained, and which was put to the following amongst other uses: In the first place, it was bought by chemical manufacturers, who obtained from it sulphate of ammonia for agricultural purposes, sal ammonia for soldering, and which was also used in calico and print works, in the production of a style of prints called "steam goods." From these two salts was obtained hartshorn, which was extensively employed in pharmacy.

Ordinary coal gas liquor was often employed to obtain, by distillation, common ammonia, which was much used in dye works; also to produce, with lichens, beautiful colouring matters, called orchil and cudbear, valuable for the production on silk and wool of delicate purple hues. The production of this colour and the influence of ammonia was exceedingly interesting, on the ground that the colouring principle called orcine was colourless until acted upon by the oxygen of the air and ammonia. If to this ammonia a fixed alkali be added, then no more orchil or cudbear was produced; but litmus, which was now much used in chemistry as a test for acids and alkalis.

One of the most interesting and useful of the applications of ammoniacal liquors was in the preparation of ammoniacal alum. The manufacture of this substance had become very extensive of late years. At the chemical works of Messrs. Spence and Dixon, near Manchester, 800,000 gallons of ammoniacal liquor were annually consumed in the manufacture of ammoniacal alum, the ammoniacal liquor being obtained from the extensive gas works belonging to the corporation of Manchester. The manufacture of this substance, which was so valuable as an astringent, and also to the dyer and calico printer, furnished such a remarkable illustration of the value of chemistry in aiding manufacturers and commerce, that he would explain briefly the method of producing it. To obtain this substance called ammoniacal alum, a refuse product of coal pits, known as aluminous shale, was heaped into small mounds and slowly burned. Shale was ge-

* The above highly-interesting and important remarks form part of a lecture read by Professor Calvert before the Society of Arts, &c., on the evening of Wednesday, Nov. 22.

nerally found in hard masses, which fell from the roofs of the coal mines, and the object of burning it was to render it porous and friable. The calcined friable mass was then placed in large leaden vessels, with sulphuric acid, having a specific gravity of 1·65, being the strength in which it was obtained from the leaden chambers. It was a curious fact that this sulphuric acid could be produced from another refuse found in coal mines, namely, pyrites.

The calcined shale and sulphuric acid were heated in these leaden chambers for about forty-eight hours; the liquor was then drawn off and put into another vessel, into which the ammonia generated from another refuse of coal, namely, the gas liquor, was introduced in a gaseous state. Thus these three substances, the alumina from the shale, the sulphuric acid obtained from the pyrites, and the ammonia from the gas liquor, combined to produce ammoniacal alum, which then only required purifying by successive processes of crystallization to give it that remarkable purity in which it was furnished to the commercial world by Messrs. Spence and Dixon, and other manufacturers.

A great boon would be conferred upon agriculturists if the ammonia which was produced when coke was made in common ovens, were saved, as recommended by Dr. Lyon Playfair, who estimated that every hundred tons of coal would yield, on the average, about six tons of sulphate of ammonia. The quantity of coke made annually in England amounted to at least 1,000,000 tons, yielding, therefore, 60,000 tons of sulphate of ammonia, which might be made a cheap and valuable agent in agriculture. When the minimum advantages which manufacturers had derived from saving the ammoniacal products in gas works were remembered, it ought to encourage coke manufacturers and engineers to exert themselves to effect the same. In so doing they would confer a great benefit on the public, as coke would thus be enabled to be sold at a lower price. It was interesting to reflect that, no doubt, at the present day, tons of salts of ammonia were made, where formerly pounds were imported into England, from a district called Ammonia, in Nubia, in Egypt, and which, in the form of sal-ammonia, was derived from heating in glass vessels the soot which had been produced by the burning of camels' dung. The same line of thought might also be applied to alum, which formerly came entirely from the East, then from the environs of Rome, and now, through the application of chemistry to manufactures, the progress of human intelligence, the undaunted perseverance of our countrymen, was manufactured in England from what had been hitherto noxious and refuse products.

Mr. Crace Calvert next spoke of tar. This substance was generally sold to the tar distillers, who obtained from it a volatile fluid called coal naphtha, a light oil, composed principally of carbolic acid, and a heavy oil of tar, a solid substance called pitch being also left in the retort. Mr. Crace Calvert then proceeded to state the applications which these various materials received. Pitch had of late years been used successfully by the corporation of Manchester in assisting to pave the streets. When the streets were repaved, a large quantity of this pitch, to which was added tar and asphalte, was heated in portable boilers in the street, and was poured, when in a hot liquid state, upon small pebbles or gravel between the interstices of the paving stones, which were thus firmly bound together, and became so durable that the most frequented thoroughfares in Manchester, when thus paved, had not required repaving for several years. There was, however, this important sanitary advantage connected with the plan, and to which he wished to draw special attention; namely, that no impure matter and stagnant water could percolate through the impervious pavement, and collect beneath, giving forth noxious effluvia, to the injury of the health of the inhabitants of large cities, and even causing dangerous epidemics. The importance of this process would be the more apparent when it was calculated what a vast surface area was presented by the streets of a large city.

This pitch had also of late been submitted by Mr. Bethell to a further distillation in retorts, which enabled him to obtain a porous, but at the same time a dense coke; and the oils which were distilled in this operation appeared to be such as might be employed to advantage as lubricating agents for common and heavy machinery. Before passing to the various volatile products obtained from the distillation of tar, Mr. Crace Calvert stated, that tar had been applied lately, when mixed with gutta percha or India-rubber, to insulate telegraph wires, and to prevent metals from being acted upon by the atmosphere.

One of the first products which came over in the distillation of tar, was a mixture of very volatile hydro-carbons, which had received the name of crude naphtha; and this, when again distilled, was sold under the name of naphtha, and was chiefly burned by the keepers of stalls in streets and markets. When naphtha had been mixed with turpentine, it was called camphine, and was burned in lamps in private dwellings.

When it was intended to apply this naph-

tha to more particular purposes, it was purified by mixing it with ten per cent. of its bulk of concentrated sulphuric acid; and when the mixture was cold, about five per cent. of peroxide of manganese was added, and the upper portion was submitted to distillation. The rectified naphtha found in the receiver had a specific gravity of 0·85. This rectified naphtha was used to dissolve caoutchouc for making garments impermeable to water, known as Mackintoshes; and when sulphur was added, and the mixture submitted to steam having a temperature of from 400° to 500°, vulcanized India-rubber was produced.

Rectified naphtha was also used for mixing with wood naphtha, to render the latter more capable of dissolving resins for the production of cheap varnishes. When this rectified naphtha had been submitted to a series of further purifications, it had received from an eminent French chemist, named Pelouze, the name of "benzine," which had the property of removing, with great facility, spots of grease, wax, tar, and resin, from fabrics and wearing apparel, without injuring the fabric, its colour, or leaving any permanent smell or mark, as was the case with turpentine. Benzine had, through his (Mr. Calvert's) exertions, been introduced into England, and had been found most valuable in brightening velvets, satins, &c. The numerous uses to which this valuable product could be applied in manufactures must, in time, render it of extensive employment in place of alcohol and other fluids, which were, generally speaking, too expensive for common commercial purposes. As an instance, he cited that at the present day, in Yorkshire, there was a large quantity of wool dyed before it was spun, principally for carpet manufactures. It was then necessary to oil this dyed slubbing wool, as it is called, and up to the present time no means had been discovered of removing the oil without injuring the colour, and thus this oil remaining in the fabric, materially injured the brilliancy of the colour, as well as rendered the carpets thus manufactured liable to become sooner faded or dirty. Now, by the employment of benzine, which had not the property of dissolving colours, the oil could be removed from such fabrics, and the full brilliancy of the colours fixed on this slubbing wool be restored. He also stated that this benzine could be employed with advantage in photography, in removing the grease from daguerreotype plates. When this benzine was treated with strong nitric acid, it gave rise to a substance called nitro-benzine, which was every day becoming more and more employed as a substitute for essence of bitter almonds, and used for flavouring dishes, and communicating scents to perfumery, soaps, &c. It was interesting to observe that thus, by the triumphs of chemistry, a delicious perfume had been produced from the noxious smelling refuse of coal.

(*To be continued.*)

## ON THE MEANS OF AVOIDING SMOKE IN BOILER FURNACES.

The discussion on Mr. Woodcock's paper on the above subject being renewed at the Institution of Civil Engineers on the evening of Tuesday, November 21, it was shown that, although critically precise experiments for determining the amount of evaporation had not been previously made, there was no doubt of the fact of its being possible to use a lower-priced fuel, and to do the full amount of work with the boiler, without evolving any opaque smoke from the chimney; and thus, whilst complying with the requirements of the legislature, a pecuniary saving could be effected. Recently, however, by experiments on a cylindrical boiler 17 feet long by 3 feet diameter, it was said to have been shown, that $8\frac{9}{10}$ lbs. of water injected at 42° Fahr., was evaporated by 1 lb. of Newcastle small coal, when Mr. Woodcock's apparatus was in use. It was found that, with small bituminous coal, a better evaporation was maintained than when Llangennoch coal was used, and without any appearance of smoke. The cast-iron bridges of the furnace did not appear to suffer from the effects of the fire; the passage of the air keeping the metal comparatively cool.

As soon as the valves of the apparatus at Messrs. Meux and Co's Brewery were closed, there was a dense smoke; but on the instant of opening them, the heated gases combined with the oxygen of the air, and flashed into bright flame. Llangennoch coals had been generally used at Messrs. Meux and Co.'s Brewery, not from any economy they offered, as they were not so strong as the Newcastle coals, but for the sake of the neighbourhood, as they did not give out opaque smoke; however, with the apparatus described by Mr. Woodcock, small Newcastle slack could be used, and as it could be purchased at 14s. per ton, whilst the Llangennoch coal cost 28s., there must, it was contended, be a money saving, and the boilers worked quite as efficiently.

As to the general similitude between the principles advocated by Mr. C. Wye Williams, and those brought into notice by Mr. Woodcock, almost the only difference appeared to be, that the former insisted on the necessity for the coldness of the air admitted, whilst the latter contended for the advantage

of heating the air, prior to its mingling with the gases. On this point many conflicting opinions were given and examples quoted. It was, however, allowed that the arrangement of the Venetian blind screens below the grate-bars was novel, and was likely to be beneficial in preventing radiation into the ash-pits, and thence into the boiler-rooms of steam-vessels, and there would not be any inconvenience from not being able to introduce prickers from beneath the bars, as good stokers always cleared the bars from above, by the use of the T-head tool, and none but idle or bad stokers allowed the clinkers to accumulate so as to run between the bars, and require the use of the pricker.

The use of heated air was practically contended for, because, when the air was admitted at a low temperature, there was a certain amount of loss from the chilling effect of the stream or film of air before it mingled with the gases; whereas this effect was not perceived when the air was admitted at a certain temperature. Under Mr. Williams's system, this had been attempted to be provided against by multiplying the number and diminishing the individual area of the apertures for admitting air; but it was argued that, by extending the apertures still more, and previously raising the temperature of the entering air behind the bridge, the object would be more certainly attained. The system of supplying air at a very elevated temperature under gas retorts, had been very advantageously employed for many years in conjunction with the hollow bridge originally introduced by Mr. Farey, the father of the late Mr. John Farey (M. Inst. C.E.) In corroboration of these views, it was stated that, on board one of the *Citizen* steam-boats on the Thames, by a free admission of air, only through a series of parallel wire-gauze screens in the fire-door, so as to distribute it in minute jets, the exhibition of opaque smoke had been prevented, whilst a saving of fuel was effected, without any loss of speed, or any extra labour to the stoker. A hollow bridge was also used, and a blast-pipe being extended from the base of the funnel, and opening into the bridge, further beneficial effect had been produced.

A model was exhibited of a hollow cast-iron bridge-plate, with a series of vertical ribs, so arranged as to form tubes, leading up from the ash-pit to the apex of the bridge; where the air mingled with the heated gases, and passed away in flame. The currents of air up these bridge-tubes preserved the iron from destruction, by carrying off the caloric, and it became heated in its upward course.

The introduction of cold air was advocated on the ground that a mass of air, once broken up into films or minute jets, would not again unite, but that each particle would pursue its independent course, until it combined with the heated gases. Therefore, the system of admission by the perforated fire-door, so as to pass over the incandescent fuel, had been so strongly advocated.

It was urged, that mechanical or other means should be adopted for regulating the proportion of oxygen, according to the state of incandescence of the fuel on the bars. This, it was contended, was virtually accomplished through the side tubes of Mr. Woodcock's apparatus, as it has been shown that the velocity of the passage of air through the tubes was exactly in proportion with the demand for oxygen by the fuel. That the air was really heated in its passage had been shown, it was said, by inserting a thermometer, protected from radiated heat, into a flue in connection with the hollow bridge.

The question of the applicability of most of the systems of preventing the exhibition of opaque smoke, was said to depend, to a great extent, on the area of the fire-grate and the size of the boiler; for if both were restricted, so as to demand an excessively rapid draught, there could not be a sufficient mingling of the gases to insure perfect combustion.

## THE COMBUSTION OF INCOMBUSTIBLES.

*To the Editor of the Mechanics' Magazine.*

Sir,—Will Mr. Woodcock favour us with the details of his experiments for ascertaining the heat imparted to the air which passes through his tubes? Accurate measurements of temperature in such circumstances are a desideratum which has excited some attention; such data will prove extremely interesting. From reading the description only, previous to the drawing being supplied, I had misconceived the position of these tubes. Such lateral passages are not calculated to impart much heat to the rapid current passing through them.

If the theory of combustion is, as Mr. Woodcock states, vague and perplexing to all, it ought not to be so. Hardly any subject is more simple, or more readily understood. What is more within the reach of every person than a candle? When lighted, we see the hydrogenous portion of the gas, which, by its greater affinity for oxygen, is first ignited, exhibiting a blue flame around the wick from which it issues; over this, the carbonaceous constituents are ignited, forming the luminous flame brightest in the hottest part immediately over the hydrogenous flame. As the heat diminishes upwards, the carbonaceous particles increase, the combustion is less vivid, until the apex shows symptoms of *smoke*—that is to say, of

particles of carbon liberated and unconsumed—darkening the products of combustion. Now place a lamp glass round the flame, or, as still more readily and universally accessible, a small cylinder of paper. The rarefaction within this cylinder produces a *draught* of air much more intense than the column previously ascending, when there was no division to separate it from the air around. Combustion, in consequence, is made more perfect. A more rapid supply of cold air to feed the flame, and carry off the *effete* products, raises the temperature of the whole flame, which becomes vividly luminous to the apex of the cone, with no appearance of *smoke* or deposited carbon. Reverse this action. Instead of promoting the draught upwards, *check it* by holding a flat surface over the flame. The space beneath the obstacle becomes filled with *heated air*, and the products of combustion. The upward current being retarded, the flame grows cooler, the upper part is darkened by atoms of unconsumed carbon, *smoke is formed*, and covers the surface of the obstacle with a black coating. This black deposit or *soot* does not demand a *cold substance* for its deposition. When the wick of the candle grows long, so as to protrude through the hydrogenous flame into the carbonaceous region of combustion, *dividing* and *cooling* the centre, the soot is deposited on the hot wick in the middle of the flame, and that mushroom-like prodigy appears, so familiar to sleepy watchers of the night. If there is not air enough in a furnace to maintain the hydrogen flame with due intensity and consume the carbon, so many of these particles as are not arrested in the flues *as soot*, intersperse through the vast mass of carbonic acid, nitrogen, and steam, issuing from the chimney, and we then have *volumes of smoke*. The carbon so interspersed is as incombustible as the vapours which contain and surround it. It does not surround and vanquish the vapour even in the Irishman's sense, for it makes the enemy only the more visible, black to the eye, if not with a black eye, and any process for *burning* it is hopeless until removed from its incombustible attendants, and the "blacks" collected in a *body of soot*, which then can certainly be calcined. So that a soot calciner would indicate the desideratum for *smoke-makers*, more correctly than a smoke consumer.

To return to the candle—*blow it out*, a whitish vapour is seen to issue from the wick, which is the gas no longer under ignition. We may say that the wick then *smokes*, just as children say that a dinner is "smoking hot," or that a horse "smokes" after a gallop. But the vapour so issuing from the wick nevertheless is *not* smoke; it will not blacken paper any more than the smoke of the dinner blackens the covers, or the smoke of the horse the face of the rider. We may witness the same fact in our chamber fires. Smoke, in the incorrect phrase, rises from fresh fuel when thrown on. But this is really *gas*, not smoke. No smoke can appear until some portion of that gas is inflamed, when if the heat is not sufficient for perfect combustion, the blackening vapour containing particles of unconsumed carbon is developed. Therefore, as Mr. Williams points out, there can be no smoke where there is no flame; smoke being the consumed vapours, loaded with particles of unconsumed carbon, deposited by flame not adequately supplied with air. I cannot see there is anything perplexing in a theory proved by such simple experiments. It is thus that smoke must be consumed *before* it is produced, and not *after*.

I do not for a moment question the scientific acquirements which Mr. Woodcock assigns to his advocate. The *badinage* which enlivened his long letter did not leave the impression of a very hard-worked man. But if he is so, it is considerate not to call on him again, though I was not aware he had been called on at all, as he stated his effort was a voluntary one, unknown to Mr. Woodcock as a stranger, and which he apologised for performing. But I doubt if he will thank Mr. Woodcock for attempting to overrule the discussion by quoting his colleges. It is a bad sort of argument to bring *names* against *facts*. I was struck lately with some admirable remarks in your Magazine upon the tendency in these times to sway truth by the influence of names with handles to them. Whether the handle is in front in the shape of a title, or in the rear in the mystic initials of some society, we have abundant evidence that neither symbols denote infallibility. In fact, the ruinous use which has been made of these appendages—in gold companies for instance—places their value rather at a discount. I have a little experience in some of our most important industrial pursuits, such as mining, iron-making, and the details of steam power, and can safely assert that the professors with handles are much behind upon points which will form the *learning* of the next generation. Therefore I do not think any college authority will be able to put down the real facts of the science of combustion. Still, as Mr. Mansfield quotes one authority that he himself relies on, viz., Mr. Prideaux, I would refer him to the experiments detailed by that author, in proof of the effects of heated air in *diminishing combustion*.

I would add one word on the subject of hot-air furnaces, as referred to by Mr. Wil-

liams. In consequence of the diminution of the weight of oxygen in a given volume of blast by heating it, it becomes necessary to enlarge the diameter of the orifices by which the blast enters the furnace. Thus, if a furnace is blown with cold air through a tuyère 2 inches in diameter, the opening is increased to 3 or 4 inches when the blast is heated. The area, thus increased several times, permits a sufficient quantity of oxygen to enter for the requirements of smelting. The great economy in the use of heated air in the iron manufacture arises thus. More than 300 tons, by weight, of the nitrogen of the atmosphere is passed through a furnace in full work during 24 hours—about 18 tons of nitrogen to each ton of pig iron. To raise this vast volume of non heat-producing gas from the mean temperature of 60° to the melting heat of 2000° and upwards, a weight of coke is consumed more than double what the solid materials require to melt them. The coal or coke in a blast-furnace is a costly material. Therefore, by imparting a heat of 800° to this nitrogen before it enters the furnace, in stoves heated by the cheapest and commonest fuel, the consumption of valuable fuel in the blast-furnace is reduced two-thirds, and a ton of iron made with 1 ton of coke or coal, instead of with 3 tons. Practical men, accustomed to the use of heated air, look narrowly into mere assumptions; it will, therefore, be important to have the details of Mr. Woodcock's experiments on the heat of the air which has passed his tubes.

I am, Sir, yours, &c.,
DAVID MUSHET.

P.S. There seems no subject on which more old patents have been re-patented than on "smoke-consuming;" to see the same thing patented half-a-dozen times over is not uncommon. There is no new feature in the fact which Mr. Woodcock alleges as the proof of the value of his invention—namely, that the smoke is destroyed by the admission of air through perforations at the bridge; this is the long-proved consequence of *cold* air so admitted. Now the presumption is, that as dame Nature is not skittish in her operations, but very regular, she is not likely to produce the same effect by directly opposite causes—to blow hot and cold at once. But even supposing that she is pleased to specially repeal her own uniformity in favour of some individual hot-air patentees, and do the same thing two ways, there will still remain this question—Is it worth while taking the trouble and expense of making the air hot, when we know that cold air will do just as well?

## WOODCOCK'S SMOKELESS FURNACE.

*To the Editor of the Mechanics' Magazine.*

SIR,—Before continuing the review of Mr. Mansfield's letter (see your number of the 14th ult.), some remarks are necessary to prevent the public being misled by his advocacy of Mr. Woodcock's furnace arrangements, in which he has dwelt at length on those that are unimportant, while he passes by that which refers to the true question of what is useful and effective. Mr. Mansfield, however, has given it an importance by making it a text, on which the real merits may be advantageously considered.

Mr. Mansfield says, "The principle embodied in Mr. Woodcock's furnace is the same as that which Argand introduced into the construction of his lamps." This is unquestionably true; and it was by the applying this very principle to the furnaces, in 1839, that I succeeded in effecting as perfect combustion on the large scale, as Argand did on the small scale of the lamp. My furnace was subsequently named "The Argand Furnace," not, however, by me, but by Mr. Henry Dircks, then of Manchester, and which name Dr. Ure and Sir Robert Kane subsequently considered as so appropriate. Not content, however, with stating what was true, Mr. Mansfield injudiciously went further, and has attempted to explain what that principle of Argand was. To this, Argand might justly and indignantly reply, that he has done it "so abominably, that he had as lief the town-crier had been at it."

Mr. Mansfield says, "The principle which Argand introduced was, the supplying air to an imperfect flame, where it was wanted, beyond the seat of primary combustion." This flight of fancy was, no doubt, intended to "split the ears of the groundlings." Without, however, stopping to show that, chemically, it is incorrect, and, practically, is sheer nonsense, I may, for the argument's sake, ask, what this "seat of primary combustion" means, or, where it is situated, either in the lamp or the furnace of his sagacious friend? The question then remains—what is the principle of Argand, and what is its operation or effect? that we may make it as useful in our furnaces, as we see it in our lamps and gas burners; and thus relieve our manufacturers from the quackery and extortions of these "smoke burners."

Argand's principle was not, as Mr. Mansfield alleges, the "supplying air to an imperfect flame" (seeing that nothing of the kind exists where the principle is properly applied), but, by a simple mechanical arrangement, bringing *the air* into such instantaneous atomic mixture and contact

with *the gas*, that perfect combustion is as instantaneously effected; in fact, preventing the existence of any "imperfect flame."

Now, with reference to a furnace and its gases, this is precisely what is effected, chemically and practically, by the perforated diffusion plate. It may here be observed, that it is a matter of indifference what description of perforations is adopted—whether circular or by thin fibres—*division of the air, and a corresponding increase in the surfaces of contact being the desideratum.*

By division, the great volume of air (100,000 cubic feet for the gas alone generated in the furnace-chamber, from each ton of coals), instead of entering *en masse*, or in large streams, and by which a cooling effect would be produced, it is thrown into such numerous jets or divisions, and necessarily producing commensurate surfaces for contact, as it enters the atmosphere of the gas in the furnace, that mixture, union, and combustion are instantaneously effected.

Here, then, is indicated the simple and natural course which the owners of furnaces may adopt, and by which they may avoid the complication and expense of those additions which the smoke-burning and hot-air advocates introduce, and which give a colourable ground for their heavy exactions.

Mr. Mansfield, with great *naiveté*, observes, "Mr. Woodcock's method is so obvious, that in considering the question of the *consumption* of smoke [doubtless he means in our stomachs and lungs, as Lord Palmerston humorously observed to one of the anti-smoke deputations] I, and no doubt hundreds of others, had long ago concluded that that was the most direct way to effect this object. [Indeed!!! What a pity such valuable conclusions had not long ago been acted on!] I supposed, however, that as there was nothing new under the sun, it must have been tried long ago, and found to fail. It appears, however, that the thing was untried even in 1854, till the sagacity of this gentleman (Mr. Woodcock) carried it into execution!" One is here tempted to ask, is all this the result of mere simplicity, or cunning, or is it sheer ignorance of what has been so long before the public, and successfully adopted in thousands of instances in the manufacturing districts and in Scotland? This use of the perforated diffusion plates (which Mr. Woodcock has imitated), has been largely commented on in the *Mechanics' Magazine*, the *Mining Journal*, and other periodicals. It was made the subject of a special communication to the British Association, in Manchester, by Mr. Houldsworth, the inventor of the pyrometer. Mr. Fairbairn also made it the subject of a paper, read by him to the Association, "On the Consumption of Fuel and the Prevention of Smoke." That paper will amply repay perusal, and has lately been published by Weale, London. One may then ask, where has Mr. Mansfield been during the last fourteen years?

In my last letter I mentioned Dr. Ure's illustration, in his "Dictionary of Arts," of that which has been so unwarrantably claimed by Mr. Woodcock. I may refer to the same Dictionary, under the head "Evaporation," where the Doctor details the experiments illustrative of "Mr. Houldsworth's economy of evaporation," observing, "The average heat in the flue was ascertained by the pyrometer. The air (cold) was admitted partly at the door, and partly at the bridge through one of Mr. Williams' diffusion boxes." He then goes on to show the result, that no smoke was produced, while the gross quantity, and the quantity evaporated by each pound of coal, were both increased. Now, will Mr. Mansfield say that Dr. Ure, Mr. Fairbairn, Mr. Houldsworth, and Sir Robert Kane are authorities unworthy his attention? and will he continue to assert that "*the thing* was untried even in 1854, till the sagacity of Mr. Woodcock brought the thing to light?"

No doubt, feeling a little qualm of conscience when he wrote these palpable misrepresentations, he quietly adds, "I believe, nevertheless, that a method *somewhat similar*, that of introducing cold air to the fumiferous gases behind the bridge, has been tried and has failed." With equal truth he might add, that *Argand's lamp* had failed, and prove it too, by telling us that his stupid servant never was able to manage the cotton wick of the lamp so as to prevent its producing smoke.

Under the conviction of the importance of the subject, I will, with your permission, continue its discussion in my next, when I will afford a notable proof of the contradictions of the hot-air advocates, in a conflict between Mr. Prideaux and Mr. Mansfield.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, Nov. 25, 1854.

## ON CANAL LOCKS:

### THE EMPLOYMENT OF THEM IN TRANSFERRING VESSELS.

*To the Editor of the Mechanics' Magazine.*

SIR,—Permit me to occupy a small space in the columns of your excellent journal with a few observations on the matter discussed by your correspondents T. T. W. and Mr. Baddeley in pages 351, 373, and 397, of your October part.

As the subject is one of some importance

in canal navigation, and as even amongst canal men themselves a great diversity of opinion has been expressed, I think it will only add to the confusion in which the matter is now involved, if the erroneous conclusions of your correspondents remain unnoticed.

The result of this investigation appears to be this—that in *ascending* a lock, more water will be required from the upper level with a laden boat than with an empty one; and that in *descending*, the laden boat will require less water from the upper level than the empty one.

Now, if a laden boat in its ascent takes more water from the upper level (which we will suppose to be the summit level of the canal) than an empty one, of course more water must be drawn from the reservoir which feeds this upper, or summit level, to make up for the greater consumption of water in passing the heavy laden boat up to this level; and *vice versâ* in the case of a descending laden boat, less water will require to be drawn from the supply reservoir.

This cannot be so; the high-water mark in the upper level *will not be affected in the slightest degree*, whether the boats which are passed into it through the lock be loaded or empty; and if T. T. W. will only pursue the investigation a little further, he will see, by the aid of his diagram, that when the boat X′ has been raised to X″, that only a lockful of water has been drawn from the upper level or ground of water, which we will suppose has sunk the water in that ground one inch. Now whether the boat X″ remains in the lock, or whether it is floated out of the lock through the upper gates to the position X‴, the level of the water in the ground will still remain only one inch under its full head; because although 50 tons of water flow back into the lock when the boat X″ leaves it, still the loss of these 50 tons of water is compensated for completely by the displacement of the loaded barge which is equal to 50 tons.

In the ascent of an empty barge (which for the sake of argument we will suppose to draw no water), of course exactly a lockful of water will be drawn from the upper ground, which will, as stated before, lower the water level one inch.

And so in every possible case it can be shown, that whether laden or empty, the levels of the grounds, and of course the consumption of the water from the reservoir feeding the summit level, remain the same.

It might be useful to pursue this subject further, but I trust that I have said enough to induce T. T. W. and Mr. Baddeley to look deeper into this matter than they have yet done. I am, Sir, &c., J. L.

King's Langley, Nov. 23rd, 1854.

## THE LUNAR REVOLUTION.

*To the Editor of the Mechanics' Magazine.*

SIR,—The assumed law of the revolution of the moon round the earth is based on a physical impossibility. The moon always presents the same face to the earth. To account for this, some philosopher or other suggested that the moon revolves but once on her axis during the twenty-eight days in which she encircles the earth. This suggestion has been adopted, and is taught as a fact, in all colleges and works on astronomy. But put it to the test. Let "A Mechanic" construct a piece of mechanism which shall exhibit a ball revolving on its axis, and yet keeping the same hemisphere presented to another ball, placed in the centre of the orbit of the satellite. Whether the centre ball is motionless, or revolves on its axis twenty-eight times or twenty-eight hundred times, makes no difference. The *fact* will be found a physical impossibility, and a machine which exhibits it a greater wonder than the perpetual motion. If the moon always presents the same face to the earth, it *does not revolve on its axis at all.* This *fact* does not agree with certain theories, and it has, therefore, been explained away by another *fact* which is *impossible.* This and other most important fallacies, taught in astronomical physics, are clearly exposed by Mr. Evan Hopkins, in his work on "Terrestrial Magnetism." But the errors which he corrects, absurd as they are, have been too long enthroned in high places to be dismissed in a day. A profoundly practical philosopher, who teaches nothing but *proved truth*, can only be fully appreciated in another generation, when the *theories* he attacks are gradually worn away.

I am, Sir, yours, &c.,

DAVID MUSHET.

November 28, 1854.

## ROCKETS ARMED WITH PERCUSSION-SHELLS.

*To the Editor of the Mechanics' Magazine.*

SIR,—In the *Illustrated London News*, of Saturday last, there is a description, with an engraving, representing the destructive effects of a rocket that struck H.M.S. *Agamemnon* twelve feet below the water-line. This peculiar power of the rocket is a fact new to many. Had the shell of that rocket been constructed on the principle of my rifle percussion-shell, striking *point foremost*, and charged with the percussion-powder, made of a mixture of chlorate of potass and sulphurate of antimony, such as I suggested to the Select Committee of Artillery Officers

at Woolwich, in the summer of 1823 the effect of the explosion would have been far greater, because the principal effect of the bursting of my shell would have been *inwards*, and the explosive power of the composition I use is five times greater than that of the best gunpowder; besides, the explosion of the percussion-shell and its momentum act simultaneously.

I am, Sir, yours, &c.
J. NORTON.

Owen's Hotel, Liverpool, 23rd Nov.

## WHEEL-CUTTING.

*To the Editor of the Mechanics' Magazine.*

SIR,—I want a wheel cut in 819 teeth. The engine at my disposal is in the same condition as that named in your preceding numbers. I think some of your correspondents will be kind enough to tell me how to do it, and give me a general rule, if possible, by which I may cut any other number I may require.

I am, Sir, yours, &c.,
S. B.

London, Nov. 27th, 1854.

*Mathematical Essays, Doctrinal and Critical, upon the Differential and Integral Calculus: being in Vindication of the Newtonian Law of Indefinite Diminution.* By JOHN HUGH WHARRIE WAUGH, Esq., A.M. Andreap. H.E.I.C.M.S. Edinburgh. Johnstone and Hunter. 1854.

THE subject of Mr. Waugh's book is, unquestionably and confessedly, one of the most difficult and abstruse in the whole range of science. The Differential and Integral Calculus is the most powerful means of investigating the physical laws of the universe which the human intellect has discovered; and the greatest names of modern science, such as Newton, Euler, Laplace, Lagrange, Poisson, &c., are associated for ever with the history of this calculus. But, unfortunately, the foundations of the calculus itself are involved in difficulties which are all but insurmountable. The superstructure—the various and ever-increasing application of this calculus—literally reaches to the skies; but the foundation lies deeper and lower than ever yet plummet sounded. Truth lies, we know, at the bottom of a well; but this "well," we fear, is unfathomable; at least, no one has ever yet succeeded in reaching the bottom of it. To drop the metaphor, however, we must say, in plain English, that Mr. Waugh has added one more to the unsuccessful attempts at removing the difficulties and obscurities in which the "principles" of the differential calculus are buried. The failure is anything but a disgrace; for none except minds of a very high order have ever cast even a glimmering of light on the subject, and few have even made the attempt, except men whose reasoning powers are far above the average. It is the intricate and difficult nature of the subject itself to which the failure is owing, and not the weakness or want of skill in its assailants and explorers.

We shall now proceed to examine Mr. Waugh's attempt at explanation. And in the first place we must remark, that the very first and most essential qualification in a writer on such a subject as this, is *clearness and distinctness*. Nobody should ever presume to write a single sentence on such a subject unless he can express his ideas with the most perfect plainness and perspicuity. As Woodhouse says (in a passage quoted by Mr. Waugh himself), "almost all the paradoxes that vitiate mathematical science take their origin from some violation of the precision of language."—("Principles of Analytical Calculation," preface, p. xv., note.) In this paramount qualification Mr. Waugh is deficient. His very title-page itself is a proof of our assertion, and an indication of this deficiency. For what is the meaning of the "Newtonian LAW of Indefinite Diminution?"

We never heard of such a "*law*" before. We soon gather the author's meaning of this phrase, indeed, when we come to read his book; but no one could tell from the phrase itself what he intended by it. He means the "Newtonian Method or Principle of Limits;" and if he had used this expression, every mathematician would have known what he meant. But to speak of a "Newtonian *Law* of Indefinite Diminution," is to speak in an unknown tongue. To say nothing of the vagueness of the term "indefinite diminution," the word "*law*" applied to it makes it altogether unintelligible. The "Newtonian Law of Attraction" is a phrase distinct and plain enough; for there is such a "law," viz., that the attraction varies directly as the mass of the attracting body, and inversely as the square of the distance between the attracting and attracted masses. But there is no such "law," and no law, indeed, whatever of "indefinite diminution." Mr. Waugh may, perhaps, call this a merely captious and trifling criticism. But it is not so in treating such a subject, where the most rigid accuracy of language is absolutely indispensable. Such a phrase, occurring in the very title-page, shows a want of accuracy in the use of language which goes very far towards disqualifying

any one from writing on the subject to any good purpose. The general style of the book confirms the suspicions thus raised at the first. It is anything but clear. The sentences are long and involved, and often convey no distinct ideas whatever, without referring to other parts of the book, and collecting the author's meaning from the general tenor of the work.

The object of the book is to defend the doctrine of "infinitely small quantities"—quantities which are *less* than any "*finite*" quantity, but yet which are greater than zero, or nothing. The way in which Mr. Waugh treats the subject amounts, indeed, almost to a *new* theory or doctrine of his own; for we question whether anybody but himself has ever maintained the existence of quantities of this sort in exactly the same sense as that in which he speaks of them. At any rate, he has used the term "equality," and employed the algebraical sign for equality in a manner in which we never saw it used before. The author has expressed himself on *this point* with tolerable clearness and perspicuity, as will be seen from the following extracts.

"Before quitting this subject, we may consider the *evanescent* cases such as

$$\frac{x^2-a^2}{x-a},\ x=a.$$

In requiring the value when $x=a$, we are not entitled to make the assumption that $x=a$ is the only form of equality that can subsist, or that mathematicians can assign, betwixt the continuous variable $x$ and the definite quantity $(a)$; if this were the case, then, truly, $\frac{0}{0}$ would be at once the correct and meaningless result; but, before attaining this absolute stage, $x$ passes demonstrably through an infinite succession of stages, in which it differs from $(a)$ by some $\phi x'$ less than anything finite or assignable; so that in taking any one of these 'innumerable values,' either before or after all difference betwixt $x$ and $a$ is utterly annihilated, we have $x=a\pm x'$, making the substitution accordingly

$$\frac{x^2-a^2}{x-a}=\frac{(a\pm x')^2-a^2}{(a\pm x')-a}=2\,a\pm x';$$

which, for all finite purposes, and in every finite sense, is rigorously $=2\,a$. Here there is no *fallacia suppositionis*, or *shifting* of the *hypothesis*; $x'$ is not first *one* thing and then *another*, but all through this and every similar investigation, one and the same, viz., a quantity less than anything finite, in virtue of which relation it is that we indifferently assert the truth of the two equivalent propositions

$$\left\{\begin{array}{l} x=a \\ x=a\pm\phi x' \end{array}\right\}."$$

(Waugh, p. 39, 40.)

Now we remark on this doctrine of Mr. Waugh's:

(1.) That the attempt to distinguish between *finite* and *infinitesimal* quantities is a hopeless task, involved in inextricable perplexities, and, we believe, beyond the province of the human intellect.

(2.) That he has used both words and signs in a very loose and unauthorized manner in this and other similar passages.

When "*all difference* between $x$ and $a$ is *utterly annihilated*," we should suppose that $x$ must be equal to $a$, and to nothing else; or, in algebraical language, that $x=a$. "No!" says Mr. Waugh; "this by no means follows. Notwithstanding that 'all difference between $x$ and $a$ is *utterly* '*annihilated*,' $x$ may still not be *equal* to $(a)$, but to some other quantity different from $(a)$. In short," he says

$$\text{"}\ x=a \quad \text{and}\ x=a\pm\phi x'$$

are 'equivalent propositions,' or the same thing. And yet $\phi x'$ is not *zero!* it is only an 'infinitely small quantity.'"

(3.) We observe, in the third place, that whether this notion be correct or not, it is certainly not *Newton's* doctrine which Mr. Waugh professes to be vindicating. But on this point the author seems to have interpreted Newton's language after a fashion of his own.

"Newton's view of evanescent quantities," says he, "has been but too frequently misinterpreted; the passage 'Per ultimam rationem quantitatum evanescentium, intelligendam esse rationem quantitatum, non antequam evanescunt, non postea, sed *quâcum* evanescunt,' seems to leave a margin for misconception; and there is no doubt this misconception has operated to the obscuration and disadvantage of the science. The intended meaning, as a matter of course, was not that the relation is attained *when* the quantities become (0) in the *absolute* and metaphysical sense, or when they actually and wholly disappear; but *relatively*, that while yet continuing to exist as real quantities, their magnitudes are to be assumed so small as to be mathematically as (0) in comparison with such quantities as those from whose subdivision, without limit, they had originated." (Mathematical Essays, p. 47, 48.)

The sentence of Newton quoted by Mr. Waugh, occurs in the Scholium at the end of the first section of the *Principia*. As the opinions of Newton on this subject must always be of the greatest interest to every mathematician, we shall give Newton's own words at length, from the *Principia*:

"Præmisi verò hæc lemmata, ut effugerem tædium deducendi longas demonstrationes, more veterum geometrarum ad absurdum. Contractiores enim redduntur demonstrationes per methodum indivisibilium. Sed quoniam durior est indivisibilium hypothesis, et propterea methodus illa minùs geometrica censetur; malui demonstrationes rerum sequentium ad ultimas quantitatum evanescentium summas et rationes, primasque nascentium, id est, ad limites summarum et rationum deducere; et propterea limitum illorum demonstrationes quâ potui brevitate præmittere. His enim idem præstatur quod per methodum indivisibilium; et principiis demonstratis jam tutius utemur. Proinde, in sequentibus, si quando quantitates tanquam ex particulis constantes consideravero, vel si pro rectis usurpavero lineolas curvas; nolui indivisibilia, sed evanescentia divisibilia, non summas et rationes partium determinatarum, sed summarum et rationum limites semper intelligi; vimque talium demonstrationum ad methodum præcedentium lemmatum semper revocari.

"Objectio est, quod quantitatum evanescentium nulla sit ultima proportio; quippe quæ, antequam evanuerunt, non est ultima; ubi evanuerunt, nulla est. Sed et eodem argumento æque contendi posset nullam esse corporis ad certum locum, ubi motus finiatur, pervenientis, velocitatem ultimam; hanc enim, antequam corpus attingit locum, non esse ultimam; ubi attingit, nullam esse. Et responsio facilis est; per velocitatem ultimam intelligi eam, quâ corpus movetur, neque antequam attingit locum ultimum et motus cessat, neque postea, sed tunc cum attingit; id est, illam ipsam velocitatem quâcum corpus attingit locum ultimum et quâcum motus cessat.

"Et similiter per ultimam rationem quantitatum evanescentium, intelligendam esse rationem quantitatum, non antequam evanescunt, non postea, sed quâcum evanescunt. Pariter et ratio prima nascentium est ratio quâcum nascuntur. Et summa prima et ultima est quâcum esse (vel augeri vel minui) incipiunt et cessant. Extat limes quem velocitas in fine motûs, attingere potest, non autem transgredi. Hæc est velocitas ultima. Et par est ratio limitis quantitatum et proportionum omnium incipientium et cessantium. Cumque hic limes sit certus et definitus, problema est verè geometricum eundem determinare. Geometrica verò omnia in aliis geometricis determinandis ac demonstrandis legitimè usurpantur.

"Contendi etiam potest, quod si dentur ultimæ quantitatum evanescentium rationes, dabuntur et ultimæ magnitudines; et sic quantitas omnis constabit ex indivisibilibus, contra quam Euclides de incommensurabilibus, in libro decimo elementorum, demonstravit.

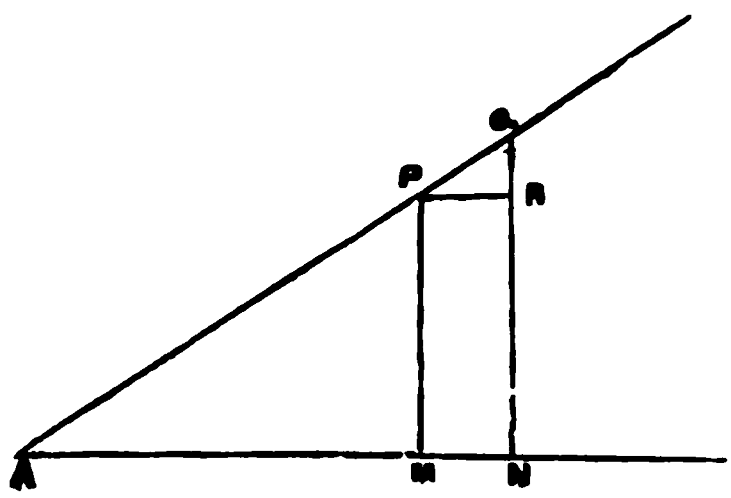
"Verum hæc objectio falsæ innititur hypothesi. Ultimæ rationes illæ quibuscum quantitates evanescunt, re verâ non sunt rationes quantitatum ultimarum, sed limites ad quos quantitatum sine limite decrescentium rationes semper appropinquant; et quas propiùs assequi possunt quam pro datâ quâvis differentiâ, nunquam vero transgredi, neque priùs attingere quam quantitates diminuuntur in infinitum.

"Res clarius intelligetur in infinitè magnis. Si quantitates duæ, quarum data est differentia, augeantur in infinitum, dabitur harum ultima ratio, nimirum ratio æqualitatis, nec tamen ideò dabuntur quantitates ultimæ seu maximæ quarum ista est ratio. In sequentibus igitur, si quando facili rerum conceptui consulens, dixero quantitates quàm minimas, vel evanescentes, vel ultimas, cave intelligas quantitates magnitudine determinatas, sed cogita semper diminuendas sine limite."—(*Newton Principia, Liber I. sect. I. Scholium.*)

It will be seen from this how different were Newton's ideas from our author's. Mr. Waugh maintains the existence of quantities (such as $\phi x'$, in the passage quoted from him) greater than zero, and yet less than any "finite" quantity; not only so, but he maintains that it is exactly and rigorously the same thing to say that $x=a$, or that $x=a+\phi x'$. Now this is a contradiction in terms. Moreover, with regard to Newton's meaning in the sentence quoted by Mr. Waugh, and which, he says, has led to "misconception;"—it is evident, by reading the whole Scholium, and especially from the illustration given by Newton in answer to objections, that he contemplated no such case as that in which (to use Mr. Waugh's words) quantities "while yet continuing to exist as real quantities, are to be assumed so small as to be mathematically as (0) in comparison with such quantities as those from whose sub-division, without limit, they had originated."

The illustration given by Newton, in the preceding extract, seems at first to remove all difficulties; but we fear that on further consideration, and when different cases are contemplated, it will be discovered that it does not. Newton's illustration may be exemplified by such a case as the following:—Two stones are thrown against a wall, one with double the velocity of the other. We suppose the velocity of the one stone to be *always*, and under all circumstances, exactly double the velocity of the other. Now when the two stones simultaneously reach the wall, there is an instant *in which* their velocities may be said to vanish, and the ratio of these two vanishing quantities is precisely what Newton

calls an *ultimate ratio*. In this case the vanishing velocity of one stone is exactly double the vanishing velocity of the other. The *ultimate ratio* is two to one. By this ultimate ratio is meant *not* the ratio of the two velocities *before* the stones reach the wall; nor yet *after* they have reached it; but the ratio *with which* (*quâcum*) they reach the wall, or with which the velocities vanish, although in this case the ultimate ratio is the same as the ratio throughout the whole motion. This appears so plain and simple, that the reader is at first inclined to conclude that he has now so clear and satisfactory an idea of "an ultimate or vanishing ratio," as to remove all further difficulties. But when we come to apply the same view to *curves*, for instance, we discover fresh difficulties,—or rather, the old ones return.




Let us take the simplest possible case, that of a straight line, A B, inclined at an angle ($\theta$) to A M. P M, Q N are the ordinates, and A M, A N the abscissæ, of the points P and Q; which points are supposed to be *as near to each other* as possible (*infinitely* near, if you like to use that phrase.) P R is perpendicular on Q N. In the usual notation,

$$AM=x, AN=x+\delta x, PM=y, QN=y+\delta y.$$

$$\tan\theta=\frac{QR}{PR}=\frac{\delta y}{\delta x}: \text{ or } \delta y=\tan\theta.\delta x.$$

Here (as in the case of the two stones) the two varying quantities always bear the same ratio to each other, throughout the whole of their course or variation: the increment ($\delta y$) of the ordinate is always equal to the increment of the abscissa ($\delta x$), multiplied by the tangent of $\theta$. This is the ratio, however small ($\delta x$) may be. But can we say (as in the case of the stones) that the *ultimate* ratio,—the ratio of ($\delta y$) to ($\delta x$), when both vanish, still presents itself as clearly to our minds as the ultimate ratio of the velocities of the two stones? Certainly not; we can conceive a final, or ultimate *velocity;* but we cannot conceive a final or ultimate straight line.

Now, as all our mathematical readers know, the principal object in the investigation of the properties of curves is to find the ultimate or vanishing ratio of the increments of the ordinate and abscissa; of ($\delta y$) to ($\delta x$). In order to find this ratio, we first suppose ($x$) to increase; to become $x+\delta x$. We then inquire what ($y$) becomes. And, lastly, we endeavour to find what $\frac{\delta y}{\delta x}$ becomes, *when* ($\delta x$) is (0) or zero.

"Now," says Berkeley, in his celebrated attack (to which Mr. Waugh has devoted several pages), "you are here guilty of bad logic; of a *fallacia suppositionis*, or shifting of the hypothesis. You first suppose ($x$) to increase; and ($\delta x$), of course, to become *something;* you then make certain calculations as to the consequent increase of ($y$); and then you turn round and put ($\delta x=0$); that is, you suppose there is *no* increase of ($x$). The very foundation of all your process you now destroy. You upset your own hypothesis. You first say, 'Let $x$ increase, and become $x+\delta x$,' in order to find what will become of ($y$). You then say, 'Let $\delta x=0$,' in order to get out a certain value of ($y$). If you first make a certain supposition, and then draw inferences therefrom, you are not at liberty to retain these inferences or conclusions from your premises, after you have altered or abandoned the supposition from which alone you obtained them. If you give up the supposition or hypothesis, you must give up the conclusion. If you maintain the conclusion, you must also maintain the original hopothesis. If you suppose the abscissa of a curve to increase, in order to see what becomes of the ordinate, you are not at liberty to make ($\delta x$)=0, for that is the same thing as to suppose that the abscissa does *not* increase." This charge of bad logic, by Berkeley, against the method in question, is admitted by Woodhouse to be well founded. This last-named author has also pointed out that Landen, who accepted Berkeley's objection as a valid one, was guilty of exactly the same "sophism" in attempting a method of his own. Our author, however, Mr. Waugh, denies that there *is* any such "sophism" in the process objected to by Berkeley; and he repeats his assertion about the existence of quantities greater than zero, and yet so small that, supposing them equal to zero, does not alter the absolute mathematical accuracy of the process. Referring to the vanishing fraction

$$\frac{x^2-a^2}{x-a}$$

and to the discussion as to its value when $x=a$, he says, "To suppose that $x$ can $=a$ in no other sense, that is, without leaving a difference, however infinitely small, is precisely the supposition that we are not entitled mathematically to make, and one

which is subversive of one of the clearest and most incontrovertible principles that regulate the continuous increase and diminution of variable quantity, that principle being that $x=a+x'$ or $=a+\phi x'$, $x$ and $a$ being meanwhile equal as *finite* magnitudes." (Page 53.) Again he says, (page 59):

"If either the pages of the *Analyst*, or any other source, are fitted to demonstrate that ($x=a$) is the only mathematical equality that can subsist betwixt these quantities, then, assuredly, both our argument, and the whole superstructure of fluxions, with all their results, are but vain and empty fictions." We really are at a loss how to characterise such an extraordinary assertion and notion as this. Mr. Waugh gravely and solemnly maintains that $x=a$, and $x=a+x'$, are one and the same thing, because $x'$ is *so very small!* Observe, he does not say (what most writers on the Differential Calculus have already said,) that $x=a$ is the *limiting* equation of $x=a+x'$; nor does he merely say that for *all practical purposes* we may *neglect* $x'$, as compared with any finite quantity: but he boldly asserts that $x=a$ and $x=a+x'$ are equally rigorous mathematical equations. In short, he introduces a totally new species of "equality;" by virtue of which a quantity may be *exactly* and *rigorously* "equal" to two different quantities at the same time. This is the most curious assertion we ever met with; and it was not without considerable hesitation and careful reading of Mr. Waugh's various repetitions of this proposition that we could believe him really to mean what we have just said. But so it is, and we must leave the reader to account for it in the best way he can. As to arguing *against* such an assertion, one might as well try to prove that black is not white. Any one may maintain that black *is* the same as white, if he chooses to attach a new sense to the word "same," exactly what Mr. Waugh has done with regard to the word "equal." It is not by such means as this that any new light can be thrown on the real obscurities of the Differential Calculus.

But although we have been disappointed in any expectations we might have formed, of fresh illustration or illumination by Mr. Waugh, of the principles of the Calculus, yet (as we said at the beginning) the very attempt does him credit, and shows that, unlike many even of those who call themselves mathematicians, he has *thought* sufficiently on the foundations of the science to be entitled to an opinion of his own. The great majority of students take for granted whatever principles their teachers give them, and hurry on to the application of the Calculus without any satisfactory examination of its foundations. We certainly think Mr. Waugh's mode of getting out of the difficulties of the subject a very queer one: but there is not one in a thousand who really understands what difficulties there are, or at least cares anything whether they be removed or not. We have also to thank Mr. Waugh for a portrait of Newton as the frontispiece of his book, and some entertaining anecdotes of a lady called Hypatia, formerly of Alexandria, beauty and mathematician,—nay, "professor of mathematics," at whose feet sat "the flower of all the youth of Europe, Asia, and Africa, all greedily swallowing instruction from her mouth, and many of them, doubtless, love from her eyes; though we are not sure that she ever listened to any solicitations, since Suidas, who talks of her marriage with Isidorus, yet relates at the same time that she died a maid." (Quoted by Mr. Waugh in a note.) It is not often that we are treated to such tit-bits in mathematical books; although we do remember, now we come to think of it, a gallant compliment to Mrs. Somerville in the preface to "Whewell's Dynamics." By the way, Mr. Waugh makes no allusion whatever to the Reverend Master of Trinity College, who has been for the last quarter of a century the great apostle of the "Newtonian Doctrine of Limits;" having published at least a dozen works, in which this is preached with the greatest zeal as the only orthodox creed. Nor has our author said a syllable about the works of De Morgan, Duhamel, Moigno, Cournot, and a whole crowd of Cambridge books, in which the Method of Limits (which was really *Newton's* method) has been adopted in opposition to Lagrange and his school. Our author cannot suppose himself the only "vindicator" of Newton's method, unless, indeed, as we have seen reason to suppose, he has interpreted Newton's language in a sense different from everybody else.

The "method" or "principle" of limits and limiting ratios is that now almost universally adopted in treatises on the Differential and Integral Calculus; whether properly or not, it is not our place here to inquire. But if by "the law of indefinite diminution" we are to understand the existence of quantities which are greater than zero or nothing, but which may be everywhere considered and treated as actually zero, with *rigorous accuracy*, and without the *slightest* deviation from the most perfect mathematical strictness,—which is the doctrine now taught by Mr. Waugh,—then we acknowledge him as the sole and original founder, apostle, and disciple of this new creed.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Manley, John, of Chacewater, Cornwall, mine agent. *An improvement in venti-*

*lation, and in treating smoke so as to prevent the ascent of the denser particles thereof into the atmosphere.* Patent dated May 4, 1854. (No. 1002.)

The main features of this invention were described on page 205 of our current volume.

EXALL, WILLIAM, of Reading, Berks, civil engineer. *Improvements in machines for cutting straw, and other such materials.* Patent dated May 5, 1854. (No. 1004.)

The inventor forms the upper roller shaft in one piece without any joint between the driving pinion and the roller, thereby causing it to rise with a slightly angular instead of a parallel motion, and arranges the pressing lever, when one is employed, in the direction of the roller shaft instead of placing it at right angles to the same.

HILLS, FRANK CLARKE, of Deptford, Kent, manufacturing chemist. *Improvements in the means of preventing or consuming smoke in furnaces.* Patent dated May 5, 1854. (No. 1005.)

*Claims.*—1. Introducing air into the back part of furnaces through the ash-pit, and between a heating plate and the bridge of the furnace, and then under a covering which projects inwards from the bridge of the furnace over the back ends of the fire-bars. 2. The employment of a perforated wall or grating placed between the bridge of the furnace and an arch below the boiler, to effect the better combustion of the smoke gases with the air admitted into the furnace by any means. 3. Regulating the admission of air into furnaces by means of a valve governed by the escape of water or other fluid or sand.

HASELER, EDWIN, of Wolverhampton, Stafford, japanner. *An improvement or improvements in ornamenting metals, papier maché, horn, and shell.* Patent dated May 5, 1854. (No. 1006.)

*Claim.* — Ornamenting the surface of metals, papier maché, horn and shell, by printing on, or transferring to, the said surfaces "negative" designs; that is to say, designs representing those portions which in the completed ornament shall consist of the uncovered surface of the material to which the ornament is applied; and afterwards gilding, silvering, bronzing, colouring, or treating by acids or other chemical agents the surface to which the said negative design has been applied, and finally removing the said negative design by means of a solvent, so as to leave those portions of the surface unaffected which were covered with the negative design.

MARTIN, ADRIEN GEORGES AMANT, engineer, and CASIMER LEFOL, of Paris, France. *Certain improvements in the manufacture of iron wheels.* Patent dated May 5, 1854. (No. 1007.)

The way in which the inventors carry their improvements into effect is by manufacturing wrought-iron wheels in a single piece, by compressing the welding hot bloom or plate of iron required for the wheel between two dies or swages, which, when put together at the proper distance, leave a space having the form of the wheel.

WONFOR, JOSEPH, chemist, in the employment of the London Manure Company, Bridge-street, Blackfriars. *Improvements in the manufacture of manure.* Patent dated May 5, 1854. (No. 1009.)

*Claim.*—"Combining chloride of sodium or magnesia with sulphuric acid and phosphate of lime when making manure."

WARNER, ARTHUR, of New Broad-street, London. *Improvements in the manufacture of metal sheets, for sheathing ships and other vessels, and for other uses.* Patent dated May 5, 1854. (No. 1010.)

The invention consists in coating sheets of zinc (previously coated with tin or lead) with sheets of copper or its alloys.

WANOSTROCHT, VINCENT, of Great Tower-street, London. *Improvements in the construction of cannon, and in projectiles to be used therewith.* (A communication.) Patent dated May 5, 1854. (No. 1011.)

Two barrels are bored by the inventor in one piece of metal with their muzzles in opposite directions, so that whenever the powder in one of them is discharged, the reactive force on the gun causes it to turn about half way round, upon a suitable trunnion; each end is in that way alternately presented for charging and discharging, so that during the time one barrel is being pointed the loading of the other takes place, a continuous fire being thus kept up.

LA MOTHE, BERNARD JOACHIM, of New York, United States, doctor of medicine. *Improvements in the construction of buildings.* Patent dated May 6, 1854. (No. 1014.)

This invention consists in constructing frames or skeletons of buildings with band or plates of iron, steel, or other metal, riveted or screwed together in parallel sets, and extending from the foundation to the top of the structure, in place of columns, pillars, or walls.

JENNINGS, JOSIAH GEORGE, of Great Charlotte-street, Blackfriars. *Improvements in the manufacture of earthenware pipes for drains and sewers.* Patent dated May 6, 1854. (No. 1015.)

The inventor describes certain pipes, called "junction or coupling pipes," which are each made of two parts, with sockets at the ends, to receive the ends of plain pipes, and such junction or coupling pipes are, when desired, made for receiving branch pipes and bends. In order to give strength to pipes for drains and sewers, the inventor makes them with exterior screw or spiral

ribs, by causing the clay or plastic earth to be forced through revolving dies.

La Mothe, Bernard Joachim, of New York, United States, doctor of medicine. *Improvements in the construction of railroad cars.* Patent dated May 6, 1854. (No. 1016.)

This invention consists in constructing railroad cars with steel or other metal strips or bands.

Jennings, Josiah George, of Great Charlotte-street, Blackfriars. *Improvements in apparatus for regulating and supplying water for water-closets and other purposes.* Patent dated May 6, 1854. (No. 1017.)

*Claim.*—The application of syphon and other described apparatus for regulating and supplying water to water-closets and other vessels.

Drewe, Henry Gregory, of Paddington, Middlesex. *Improvements in obtaining metal from ores.* Patent dated May 6, 1854. (No. 1018.)

These improvements consist in crushing ores to an impalpable powder, by means of a machine or mill consisting of crushers, which slide (without rolling or revolving on axes,) in an annular groove of a corresponding form, into which the ores to be crushed are placed; and also in running the impalpable powder thus obtained with water, and causing it in this state to pass through mercury.

Waller, Richard, of Leeds, York, gentleman. *Improvements in engines and apparatus and means of obtaining motive power from liquids, vapours, gases, or air, parts of which invention may be applied also to ordinary steam or other engines.* Patent dated May 6, 1854. (No. 1019.)

This invention consists in using condensible and permanent gases, such as carbonic acid gas, chloroform, ether, or atmospheric air, in a highly volatile and elastic state for the purpose of obtaining motive power, by means of an apparatus of peculiar construction and arrangement, which we shall probably describe at length hereafter. Although the inventor prefers to use carbonic-acid gas alone as the cheapest and most highly condensible gas, it may be mixed with chloroform or ether in the proportions of about two-thirds of carbonic-acid gas to one-third of ether or chloroform.

Cammell, Charles, of Cyclops Steel Works, Sheffield, York, steel manufacturer. *Improvements in buffer, draw, and bearing springs for railway carriages, and in the mode of or apparatus for making the same.* Patent dated May 6, 1854. (No. 1021.)

This invention relates—first, to an improved form of spring to be used for the above purposes, and consists in making the spring in the form of a double cone, the two apices of the cone being at opposite ends of the spring.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the construction of railway carriages.* (A communication.) Patent dated May 6, 1854. (No. 1022.)

In carrying out this invention, the seats of the carriages are made to slide, and thereby prevent the shock which would arise through a sudden stoppage of the train by the application of the brake. The brakes themselves are composed of a series of sliding shoes or sledges attached to the framework of the carriages, and are brought into action by lowering the body of the carriage by suitable gearing.

Higginbottom, John Hartley, clerk of works to the Local Board of Health, Ashby-de-la-Zouch, Leicester. *Improvements in the valves and apparatus connected with water-closets, certain portions of which are applicable as cocks or valves for other purposes.* Patent dated May 6, 1854. (No. 1023.)

This invention consists of an improved form of sluice-valve, with ground metal faces, the diaphragm being kept pressed against the face of the valve by the pressure of the water; it is attached loosely to the actuating spindle, which passes through a stuffing-box on the shell of the valve or cylinder, the said spindle having a cup of leather thereon, which causes it to be self-opening.

Bernard, Julian, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in machinery or apparatus for sewing, stitching, or ornamenting.* Patent dated May 6, 1854. (No. 1024.)

This invention relates—1. To an improved mode of feeding the material to be stitched, or otherwise operated upon, so as to be presented to the needle or needles at the proper time and place. 2. To an improved mode of holding the needle in the rod or slide which carries it. 3. To making the bed plate or table of sewing machines of marble, china, or stoneware. 4. To the employment of two endless bands for giving motion to the material, between which bands the needle is made to pass through the material.

Naylor, Henry Moore, of Birmingham, Warwick, manufacturer. *A new or improved instrument for cutting various articles of food.* Patent dated May 8, 1854. (No. 1027.)

This instrument is so constructed, that when it is placed on the egg, &c., to be cut, by pressing a knob a catch is disengaged from a knife or cutter, which then, being urged forward by springs, cuts off the top of the egg, &c.

Goodman, George Barry, of Salisbury-

place, New-road, Middlesex, importer of foreign goods. *Improvements in apparatus for holding together letters, music, and other loose sheets.* (A communication.) Patent dated May 8, 1854. (No. 1029.)

This invention consists in constructing an apparatus composed of a spring catch, certain prongs for holding the document, and a sliding bar for pushing it out to them.

THOMAS, GEORGE, casemaker to Messrs. Nutting, Addison, and Co., of Osnaburg-street, Regent's-park, Middlesex, pianoforte-manufacturers. *Improvements in the construction of the framework of upright pianofortes.* Patent dated May 8, 1854. (No. 1030.)

The inventor claims a mode of attaching and securing the bracings to the "rest plank" and bottom frame of the back, and the use of a bar of cast or wrought iron, for the purpose of more securely holding the metal plate in its place.

LEMIELLE, THÉODORE, of Bruxelles, Belgium civil engineer. *Improved apparatus applicable to the ventilation of mines, buildings, and other places.* Patent dated May 8, 1854. (No. 1031.)

In this invention the ventilation is produced by the movement of vanes or doors (opened by radial arms), in the space formed by the concave and the convex surfaces of two cylinders, which movement gives motion to air in one direction, whilst the return of the air in the opposite direction is prevented by the contact of the surfaces of the two cylinders, or by the closing of the doors.

NORMAND, CHARLES BENJAMIN, of Havre, France, shipbuilder. *Improved machinery for sawing wood.* Patent dated May 8, 1854. (No. 1032.)

This invention consists—1. In a novel mode of securing the timber, so as to bring it under the action of the saws. 2. In the use of a flexible or yielding table or frame, for supporting the timber to be sawn. 3. In a peculiar mode of mounting and driving saw blades.

LIDDELL, CHARLES, of Abingdon-street, Westminster, esq. *Improvements in the permanent way of railways.* Patent dated May 9, 1854. (No. 1036.)

*Claims.*—1. The mode of securing double-headed rails to iron sleepers, in which are grooves to receive the under side of the rails by means of angle-iron pieces fitted to each side of the rails, and secured or riveted to the sleepers, and through the rails to each other. 2. The mode of securing double-headed rails to wooden sleepers, by means of angle iron pieces fitted to each side of the rails, and riveted or screwed through the rails to each other, and bolted, spiked, or screwed to the sleepers.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in the manufacture of artificial stone for building and other purposes.* (A communication.) Patent dated May 9, 1854. (No. 1037.)

*Claims.*—1. The use of a mixture composed of sand or pulverized stones, plaster of Paris, and beasts' blood, for moulding or casting blocks, architectural ornaments, &c. 2. Combining powdered lime, litharge, and boiled oil with sand, thereby forming a plastic material suitable for being cast or moulded into architectural ornaments, &c.

HORSFORD, EBEN NORTON, of Massachusetts, United States. *The removal of chlorine from substances and fabrics.* Patent dated May 9, 1854. (No. 1038).

The inventor says, "It is well known that sulphurous acid is an agent which, on coming in contact with chlorine or hypochlorous acid in water, is instantly converted into sulphuric acid. This property has been taken advantage of (in this invention) to neutralize the surplus chlorine in bleached substances and fabrics."

FULLER, WILLIAM COLES, of Bucklersbury, Cheapside, London. *Certain improvements in the adaptation of India-rubber springs.* Patent dated May 10, 1854. (No. 1039.)

This invention consists in the adaptation of rings of India-rubber, or other elastic material, as springs to the anchors and cables of vessels (applied either on board the vessel itself, or to the anchor or shackle, or any part of the cable), to ropes or cables used in towing, warping, mooring, &c., and to other analogous purposes.

SPARRE, PETER AMBJORN, of Salisbury-street, Strand, Middlesex, engineer. *An improved mode of preventing the alteration or falsification of written documents.* Patent dated May 10, 1854. (No. 1040.)

*Claim.*—Covering the surface of the paper, or such portion of the paper as is to be written upon, with a design printed in two colours, alternating in close succession, one of the said colours being indelible, and the other of such nature that it can be easily discharged from the paper.

HOBY, JAMES WARD, of Renfrew, North Britain, engineer, and JOHN MILNER, of Stanley-street, Pimlico, Middlesex, engineer. *Certain improvements in steam engines.* Patent dated May 10, 1854. (No. 1041.)

*Claims.*—1. Constructing steam engines with the connecting-rod working within a trunk or hollow piston-rod, to which is attached a cross head, which works the air-pump of the engine. 2. Constructing steam engines with the connecting-rod working within a trunk attached to or forming part of a concave piston working in a cylinder with covers of corresponding form, &c.

REECE, REES, of Athy, chemist. *The smelting of iron by means of turf or peat simultaneously with the combustion of the peat and collection of the products therefrom.* Patent dated May 10, 1854. (No. 1042.)

This invention consists in the application of the method of effecting the combustion of peat by means of a blast, patented by Mr. Reece on 23rd January, 1849, to the smelting of iron.

WILLIAMS, WILLIAM, of Dublin, master mariner. *An improved propeller.* Patent dated May 10, 1854. (No. 1043.)

Mr. Williams forms a screw propeller by combining a particular form of blade or fan with a conical axis, in which is formed an opening or channel for the passage of the water after it has been acted upon by the propeller.

ANTHONY, JOHN, and WILLIAM TREEBY CHAFE, both of Devonport, Devon, engineers. *An improvement in machinery for the manufacture of pipes and tubes from lead and other soft metals and alloys.* Patent dated May 10, 1854. (No. 1044.)

*Claim.*—Combining two or more dies, and mouthpieces, and crowbars, in such manner as to allow of two or more pipes or tubes being manufactured simultaneously in the same machine.

LAWSON, JOHN, of Glasgow, Lanark, engineer. *Improvements in drawing ships out of water.* Patent dated May 10, 1854. (No. 1045.)

This invention mainly consists in the application and use of two or more water pressure cylinders for drawing ships out of water, such cylinders, or their pistons or rams, being connected to two sets of hauling apparatus, and made to act on the main hauling-chain, by means of each set of hauling apparatus alternately.

SHEPHERD, JOSEPH, of Manchester, Lancaster, engineer. *Improvements in compound steam engines.* Patent dated May 10, 1854. (No. 1046.)

This invention consists in the employment of two high pressure in combination with a low pressure cylinder, the former being provided with suitable passages and valves for opening the portions on one side of the pistons alternately to the condenser, during the whole of a stroke.

TYLOR, HENRY, of the firm of Tylor and Pace, of Queen-street, London, manufacturers. *An improvement in chair bedsteads.* Patent dated May 11, 1854. (No. 1049.)

This invention consists in constructing chair bedsteads so that those parts of the bedstead which form the legs or supports for one end shall, when the bedstead is to be used as a chair, fold over, and form the supports for or hold up that part which becomes the back of the chair.

CUNDY, JOHN, of Carrington, Nottingham, mechanic, one of a company called the Improved Reflecting Light Company. *An improved reflector, globe or shade for gas, candle, oil, and other artificial light.* Patent dated May 11, 1854. (No. 1050.)

This invention consists in coating a part or parts of glass globes with some reflective substance for increasing the light in any desired direction.

DE LA RUE, WARREN, of Bunhill-row, Middlesex. *Improvements in distillation.* Patent dated May 11, 1854. (No. 1051.)

*Claim.* — Arranging distilling apparatus so that the still, with its contents, and the free superheated steam which passes into the still may both be maintained at about the same temperature, by means of a bath or baths of heated fluid.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GIBSON, THOMAS WILLIAM, of Thomas-street, Stamford-street, Surrey, soda-water manufacturer. *Making a new beverage intended to be called "Gibson's Pinerium, or Aërated Sarsaparilla."* Application dated May 6, 1854. (No. 1012.)

"Boil four pounds of Jamaica sarsaparilla-root," says the inventor, "in two gallons of water gently, till the quantity is reduced to one gallon, and strain off the liquor while hot. Boil the root again in one gallon of water till the liquor is reduced to half a gallon, and strain off the same as before. Re-boil the two decoctions of liquor thus obtained gently, till the liquor is evaporated to two pounds weight. Dissolve in the liquor thus obtained, while hot, eighteen ounces of the best refined sugar, and when cold, add two ounces of rectified spirits. It is then fit for bottling, which may be done by putting in each bottle half an ounce of the syrup as above obtained, and then filling up each bottle with aërated water in the manner ordinarily practised in filling soda-water bottles."

ARCHDEACON, EDWARD JOHN MONTAGU, of Walworth, Surrey. *An improved book-mark or index.* Application dated May 6, 1854. (No. 1013.)

The inventor describes the form of a piece of leather which he cuts out for the purpose of attaching it to the back of a book.

BULKLEY, RALPH, of New York, United States. *The extinguishment of fires in steamers, vessels, houses, and buildings of all descriptions.* Application dated May 6, 1854. (No. 1020.)

The material employed by the inventor for extinguishing fires, consists of a combination of vegetable and mineral substances

(not enumerated) which, being deflagrated, produce large quantities of suitable vapour.

JEFFERIS, JOHN, of the Grove, Southwark, Surrey, ironmonger. *Certain improvements in packing for piston-rods, pumps, joints of pipes, and other like purposes.* Application dated May 8, 1854. (No. 1025.)

This invention consists in passing the spun yarn or hempen cord through a solution of India-rubber, so as to give it a complete coating of that material.

PFERSDORFF, CARL, of South-row, Kensall New Town. *A new toy or aerial top.* Application dated May 8, 1854. (No. 1026.)

In carrying out this invention, a light frame is made of wire, in the form of a windmill, with any number of sails or vanes which are covered with paper or other suitable material, and which, when caused to revolve quickly in an horizontal direction, rise to a great height in consequence of their pressure against the air.

LOGAN, GEORGE FOX, of Glasgow, Lanark, North Britain, boiler-maker. *Improvements in templates to be used in constructing iron ships, boats, boilers, and other metallic structures.* Application dated May 8, 1854. (No. 1028.)

The template described by the inventor is composed of a central longitudinal slotted bar, to the two opposite ends of which are attached two transverse bars, also partially slotted. These transverse bars are connected by set screws at their centres, and their slotted portions afford a means of connecting to them two other light and partially flexible bars, set parallel to and on each side of the main central bar, &c.

ADAMS, WILLIAM BRIDGES, of Adam-street, Adelphi, Middlesex, engineer. *Improvements in rails for railways, and modes of connecting and fixing them.* Application dated May 9, 1854. (No. 1033.)

This invention consists in connecting two adjoining bridge rail ends together, by applying two metal side clips, either as half chairs or brackets, and connecting them by bolts passing horizontally beneath the rails with an iron tongue-piece entering the hollow of the bridge rail, so adjusted that by the act of screwing up the bolts the tongue-piece will be forced upwards towards the crown of the rail, and the side clips downwards towards the upper side of the rail flanges.

BERQUEZ, FRANCIS PETER, of Richmond-road, Dalston, Middlesex, gas-engineer. *Improvements in cooking and heating-stoves, and in generating heat therefore.* Application dated May 9, 1854. (No. 1034.)

This invention consists mainly in constructing such stoves almost entirely of tiles or bricks, so that an earthenware surface is presented outside as well as inside the stove.

LIDDELL, CHARLES, of Abingdon-street, Westminster, Esquire. *Improvements in moving boats on canals and rivers.* Application dated May 9, 1854. (No. 1035.)

These improvements consist—1. In adapting to the moving of boats on canals, of ropes which move alternately in opposite directions. 2. In the adaptation to the same purpose of a certain method of attaching a tow line to the tractive rope. 3. In a modification of this method. 4. In the adaptation to the tractive rope of a canal of small-wheeled trucks or wagons, for the purpose of supporting and guiding the said rope, the trucks or wagons running on a suitable rail or tramway, formed alongside of the canal.

MILES, EZRA, of Stoke Hammond, Bucks, civil engineer. *An improved coupling joint or connection for tubing or other purposes.* Application dated May 11, 1854. (No. 1047.)

This invention consists in fitting the ends of pipes into a cylindrical coupling piece formed in a peculiar manner, placing a thick ring of vulcanized India-rubber between them, and holding the two together by means of a pin.

BROWN, EDWARD, manufacturer, Sheffield, York. *Improvements in the manufacture of scissors from steel and other metals.* Application dated May 11, 1854. (No. 1048.)

The inventor rolls out steel or other metal to the thickness required. Beds and punches are then applied according to the different patterns requisite. The scissors are then produced in a rough state by pressure, ready for the finisher.

## PROVISIONAL PROTECTIONS.

*Dated August* 18, 1854.

1815. Frederick Crace Calvert, of Manchester, Lancaster, professor of chemistry. Improvements in the treatment of heating, puddling, and refinery iron slags, or cinders.

*Dated August* 22, 1854.

1839. Thomas Lees, of Stockport, Chester, machinist. Certain improvements in the mode of lubricating parts of steam engines and of apparatus attached to steam boilers, and in the method of preparing and adapting certain substances for that purpose.

*Dated October* 7, 1854.

2153. Charles Blunt, of Sydenham, Kent, gentleman, and Joseph John William Watson, of Wandsworth, Surrey, doctor of philosophy. Improvements in machinery for the production of artificial fuel.

*Dated October* 18, 1854.

2227. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in preventing collisions on railways. A communication.

*Dated October* 21, 1854.

2244. Julian Bernard, of Club-chambers, Regent-street, Middlesex, gentleman. Improvements in machinery or apparatus for stitching.

*Dated October* 30, 1854.

2303. Gustave Hermann Lilie, of Amelia-villas, De Beauvoir-grove, Kingsland, Middlesex. A new material for the manufacture of paper.

*Dated October* 31, 1854.

2313. Charles Vorster, of Cologne, in Prussia, manufacturer. Improvements in the manufacture of ribbons.

*Dated November* 2, 1854.

2327. Charles Hargrove, of Birmingham, Warwick, manufacturer. Improvements in annealing cast iron, or in rendering cast iron malleable.

*Dated November* 3, 1854.

2329. Henry Walmsley and John Day, both of Failsworth, near Manchester, Lancaster. Improvements in looms.

2331. Claude Laurent Victor Maurice, civil engineer, of St. Etienne, Loire, in the French empire. Certain improvements in carbonizing coal, and in apparatus to be employed therein.

2333. Isidore Alexandre Moineau, clerk, and Jean Gustave Lemasson, professor of natural history, of Paris. Improvements in elastic mattresses and seats.

2335. James Atherton, of Preston, Lancaster, machine-maker, and John Kinlock, of the same place, manager. Improvements in machinery or apparatus for preparing and sizeing or dressing yarns or threads.

*Dated November* 4, 1854.

2337. George Lee Baxter, of Sneinton Hermitage, Sneinton, Nottingham, dyer. Improvements in reaping-machines.

*Dated November* 6, 1854.

2341. William Collis, of Barnes, Surrey, brewer. An improvement in brewing.

2343. Joseph Betteley, of Liverpool, anchor-manufacturer. Improvements in the construction and manufacture of iron knees, and the application thereof for ships' fastenings.

2345. James Wallace, junior, of Glasgow, Lanark, North Britain, manufacturer. Improvements in zincographic and lithographic printing.

2347. Louis Alexandre Farjon, mechanic, of Paris, in the French empire. An improved system of jointing pipes, tubes, and conduits in general.

*Dated November* 7, 1854.

2349. James King Worts, senior, James Worts, junior, both of Colchester, Essex, and Isaac Page, of Langham, in the same county. Obtaining and applying motive power.

2351. Carl Samuel Henirich Hartog, of Islington, Middlesex, merchant. Improvements in fire-arms and in cartridges. A communication.

2353. Andrew Peddie How, of Mark-lane, London, engineer. An improved machine for cutting metal rods and bars. A communication from John Gallagher, of New York, engineer.

2357. Thomas Metcalfe, of High-street, Camden-town, Middlesex, gentleman. Improvements in the construction of portable carriages, chairs, and other articles for sitting or reclining upon.

2359. William Beardmore, of the Stowage, Deptford, Kent, engineer. An improvement in the bearings of the axles of railway carriages and locomotive engines.

*Dated November* 8, 1854.

2361. George Davis, of Southampton, Hampshire, plumber. Improvements in taps or cocks.

2363. William Stead, William Spence, and Samuel Wood, of Bradford, York. Improvements in machinery for preparing and combing wool and other fibrous materials.

2365. John Gray, of Edinburgh, Midlothian, Scotland, newspaper proprietor. Improvements in ventilating hats.

2367. Allan McDonald, of Alexandria, Dumbarton, foreman printer, and Alexander McIntosh, of Alexandria aforesaid, mechanical engineer. Improvements in machinery for stretching and smoothing cloth or woven fabrics preparatory to or in the course of being printed.

2369. Alexander Dalgety, of Florence-road, Deptford, Kent, engineer. Improvements in steam boilers.

2370. Edme Augustin Chameroy, of Paris, France, manufacturer. Improvements in the junction of sheet metal pipes, and apparatus employed therewith.

2371. George Bartholomew, of Linlithgow, North Britain, edge-tool maker. Improvements in boots, shoes, and other coverings for the feet.

*Dated November* 9, 1854.

2373. Paul Pretsch, of Sydenham, Surrey, photogapher. Improvements in producing copper, and plates for printing.

2375. David Ferrier, of Edinburgh, Midlothian, Scotland, bookseller. Improvements in facilitating a reference to books.

2376. Francis Palling, of Lambeth, Surrey. Improvements in the means of preventing horses running away upon taking fright, or other causes.

2378. Stephen Shaw, of Plaistow Marshes, Essex, boiler-maker. An improved template for marking positions and sizes in plates of metal.

2380. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in machinery for turning prismatic forms. A communication.

2381. David Tunks, of Accrington, Lancaster, watch and clock-maker. Improvements in watches, clocks, chronometers, time-pieces, and all other instruments for the measurement of time.

2382. Henry William Harman, of the Dockyard, Northfleet, Kent, civil engineer. Improvements in windlasses, capstans, crabs, cranes, and other machines or apparatus for raising, lowering, or moving heavy bodies.

2383. Frederick Smith, of York-street, Lambeth, Surrey, oven-builder. An improved construction of smoke consuming furnace.

2384. George Ross, of Falcon-square, London, merchant. Improvements applicable to the manufacture of articles of caoutchouc, or of compositions of which caoutchouc forms a component part. A communication.

*Dated November* 10, 1854.

2385. James Niven, gardener, of Keir, near Dunblane, Perthshire, Scotland. The application of a new material to the manufacture of paper, and also of textile fabrics.

2386. William Lawrence Wigginton, of Barnet, Hertfordshire. An apparatus for cooking, heating, and ventilating, applicable to dwelling-houses, &c.

2387. Edward Loysel, of Rue de Grétry, Paris, France, civil engineer. Improvements in obtaining infusions or extracts from various substances.

2388. William Jeakes, of Great Russell-street, Middlesex, engineer. An improved mode of heating and ventilating by gas.

2391. Samuel Ellen, of Wick-cottage, Hackney, Middlesex. An improved machine for washing clothes and similar articles.

2392. Henry Witthoff, of Manchester, Lancaster, merchant. Certain improvements in the construction of boats, ships, or navigable vessels, and in

the means of obviating or diminishing the dangers attending accidents to the same.

2394. Eugene Rimmell, of Gerrard-street, Soho, Middlesex, wholesale perfumer. Improvements in combining matters to be employed in coating fabrics and leather, and for other uses in substitution of India-rubber. A communication from Hippolyte Magen.

2395. Frederick Ransome, of Ipswich. An improvement in preparing oxides and carbonates of lead or zinc, and carbonate or sulphate of barytes, to render the same suitable for painting or coating surfaces.

*Dated November 11, 1854.*

2396. William Kloen, of Birmingham, Warwick, commercial traveller. A new or improved method of ornamenting and attaching labels, cards, window, and other bills.

2397. Robert Hesketh, of Wimpole-street, Middlesex, architect. Improvements in apparatus for supplying fuel to grates, stoves, and fire-places.

2398. James Thomson, of Dollar, Clackmannan, North Britain. An improvement in obtaining motive power when fluids or liquids are used.

2399. Peter Armand Lecomte de Fontainemoreau, of South street, London. Improvements in fire-engines. A communication.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2443. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in the manufacture of wrought iron, carriage and other wheels, and pulleys. A communication. November 17, 1854.

2444. William Coulson, of Fetter-lane, York. Improvements in machinery for morticing, tenoning, and boring. November 17, 1854.

## NOTICES OF INTENTION TO PROCEED.

*(From the "London Gazette," November 28th, 1854.)*

1565. John Bailey Denton. Improved hoes and spade.

1578. Charles Maybury Archer. Treating all kinds of paper whereon any printing, engraving, engrossing, letter-writing, or lithographing has been printed or impressed, so that the said printing, engraving, engrossing, letter-writing, or lithographing may be completely removed, discharged, or obliterated from the said paper, and so that the said paper may be readily re-used in sheets or be reconverted and worked up again into its primitive pulp by the ordinary method, and be again manufactured into and be used as paper.

1580. William Beckett Johnson. Improvements in steam engines.

1599. Sir John Scott Lillie. Improvements in fire-arms.

1618. William Johnson. Improvements in the treating, cleansing, and dyeing of fibrous and textile materials. A communication.

1622. John Henry Johnson. Improvements in the preparation of silk. A communication from Charles Louis Alexander Williot, of Saint Quentin, France, merchant.

1631. Alfred Vincent Newton. An improvement in the process of converting wood into paper. A communication.

1641. John Chillcott Purnelle. Improvements in obtaining and applying motive power.

1654. François Desiré Malvé and Pierre Martin. Certain improvements in heating water for feeding boilers of locomotives and marine steam engines.

1657. Samuel Frankham. An improvement in the construction of furnaces.

1666. Francis Morton. Certain improvements applicable to girders or rafters, to be used in the construction of roofs, bridges, buildings, and other erections.

1680. Edwyn John Jeffery Dixon. Improvements in apparatus for teaching reading and arithmetic.

1746. Jean Baptiste Ambroise Marcelin Jobard. A new system of pump.

1808. Thomas Webster Rammell. Improvements in stoves and fire-places.

1815. Frederick Crace Calvert. Improvements in the treatment of heating, puddling, and refinery iron slags, or cinders.

1837. John Grist. Improvements in machinery for the manufacture of casks, barrels, and other similar articles.

1847. William Johnson. Improvements in the manufacture of carding apparatus, for the preparation of fibrous materials. A communication.

1850. Robert McConnel. Improvements in shutters for doors and windows.

1882. John Kirkham and Thomas Nesham Kirkham. Improvements in the process of manufacturing and purifying gases for lighting and heating, and in apparatus to be employed therein.

1917. George Lewis. Improvements in the construction of locks.

1936. Jacques François Henry Hypolite Hervé de Lavaur. Certain improvements in securing waterproof wrappers or coverings used in packing goods.

1975. Peter Rothwell Jackson. Improvements in the manufacture of wheels.

2007. John William Perkins. Improvements in purifying gas, the residuum arising from which forms a new artificial manure.

2060. Robert McConnel. Improvements in locks.

2138. John Perry. Improvements in preparing wool for combing.

2227. Peter Armand Lecomte de Fontainemoreau. Improvements in preventing collisions on railways. A communication.

2314. Thomas Prosser. Improvements in condensers of steam engines and parts connected therewith.

2327. Charles Hargrove. Improvements in annealing cast iron, or in rendering cast iron malleable.

2329. Henry Walmsley and John Day. Improvements in looms.

2339. James Atherton and John Kinloch. Improvements in machinery or apparatus for preparing and sizeing or dressing yarns or threads.

2344. Frederic Rainford Ensor. Improvements in bobbin, net, or twist lace machinery.

2345. James Wallace, junior. Improvements in zincographic and lithographic printing.

2352. Edward Hogg. Improvements in shot and shell.

2357. Thomas Metcalfe. Improvements in the construction of portable carriages, chairs, and other articles for sitting or reclining upon.

2358. John Bird. Improvements in reverberatory furnaces.

2359. William Beardmore. An improvement in the bearings of the axles of railway carriages and locomotive engines.

2363. William Stead, William Spence, and Samuel Wood. Improvements in machinery for preparing and combing wool and other fibrous materials.

2367. Allan McDonald and Alexander McIntosh. Improvements in machinery for stretching and smoothing cloth or woven fabrics preparatory to or in the course of being printed.

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ments in the junction of sheet metal pipes and apparatus employed therewith.

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2385. James Niven. The application of a new material to the manufacture of paper, and also of textile fabrics.

2388. William Jeakes. An improved mode of heating and ventilating by gas.

2443. George Tomlinson Bousfield. Improvements in the manufacture of wrought iron, carriage and other wheels, and pullies. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## APPLICATION FOR PROLONGATION OF RYDER'S PATENT.

The Lords of the Judicial Committee of the Privy Council have appointed Friday the 1st of December, at half-past ten, A.M., for the hearing of the petition in the above-named matter.

## WEEKLY LIST OF PATENTS.

*Sealed November 24, 1854.*

1179. Julius Schmoock.
2027. James Robinson.

*Sealed November 28, 1854.*

1190. Andrien Ernest Sablons.
1199. Leopold Wertheimber.
1200. Hall Colby.
1209. Julian Bernard.
1214. John Arrowsmith.
1216. Walter Westrup.
1225. Edward Orange Wildman Whitehouse.
1229. John Mason and Louis Christian Koeffler.
1247. Napoléon Néron.
1296. James Pickup.
1327. Louis Ambroise Henry.
1332. Joseph Valentin Weber.
1363. William Stableford.
1371. Charles Cowper.
1432. John Edwards.
1463. James Newman.
1686. Joseph Green and William Jackson.
1825. Nehemiah Brough.
2019. William Henry Dawes.
2025. William Gee.
2053. Samuel Elliott Hoskins.
2126. Thomas Cooper.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

| Date of Registration. | No. in the Register. | Proprietor's Names. | Addresses. | Subject of Design. |
|---|---|---|---|---|
| Nov. 9 | 3655 | W. Powell and Son | Bristol | Stopper. |
| 10 | 3656 | Robotham and Son | Birmingham | Carriage-lamp. |
| 14 | 3657 | T. Bryan | Wolverhampton | Bedstead-sacking. |
| 18 | 3658 | G. H. Wain | Liverpool | Pulley-block. |
| ,, | 3659 | S. Bentley | Birmingham | Gas-pipe elbow. |
| ,, | 3660 | W. J. Page and E. J. Page | Kennington | Cricket-bat handle. |
| ,, | 3661 | Brochier, père et fils | Grenoble, France | Gloves. |
| 27 | 3662 | Smith and Ashby | Stamford | Chaff-cutting frame. |
| ,, | 3663 | J. Grove | Birmingham | Chessboard. |
| ,, | 3664 | Twigg and Silvester | Birmingham | Button-centre. |
| 29 | 3665 | J. Wren | Tottenham-court-road | Chair-bedstead. |

## LIST OF PROVISIONAL REGISTRATIONS.

| | | | | |
|---|---|---|---|---|
| Nov. 10 | 618 | J. Green | Doncaster | Barrelled crab. |
| 20 | 619 | J. Feltham | Barbican | Archery-glove. |
| 24 | 620 | D. S. Brown | Old Kent-road | Cannon. |
| 25 | 621 | Carrett, Marshall, and Co. | Leeds | Steam-pump. |
| ,, | 622 | Carrett, Marshall, and Co. | Leeds | Lift-engine. |
| 27 | 623 | E. D. Robinson | Birmingham | Penholder. |
| 29 | 624 | N. Dickins | Stockport | Ink-bottle. |

## NOTICE TO CORRESPONDENTS.

The hasty and apparently too brief reply given in our last number to "A Mechanic of Darlington," is, we find, likely to mislead. It should be stated that although the existence of a law connecting the rotations of satellites round their axes with their revolutions in their orbits has not hitherto been demonstrated, it has been a subject of speculation among astronomers. Humboldt says the coincidence of the times of revolution of secondaries round their axes and round their primaries is "highly probable." Sir John Herschel, in his "Outlines of Astronomy," says, "From this circumstance, &c., it is presumed with much certainty that this satellite (one of Saturn's) revolves on its axis in the exact time of rotation about the primary, as we know to be the case with the moon, and as there is considerable ground for believing to be so with all secondaries." Comte, Lagrange, Poisson, and others, have adverted with more or less confidence to the subject. It is in fact a feature of Laplace's "Nebular Hypothesis," and has been employed by the author of the "Vestiges of Creation" in support of that theory.

*Errata.*—No. 1623, page 276, first paragraph:—for "first" read "second," and for "second" read "first."

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

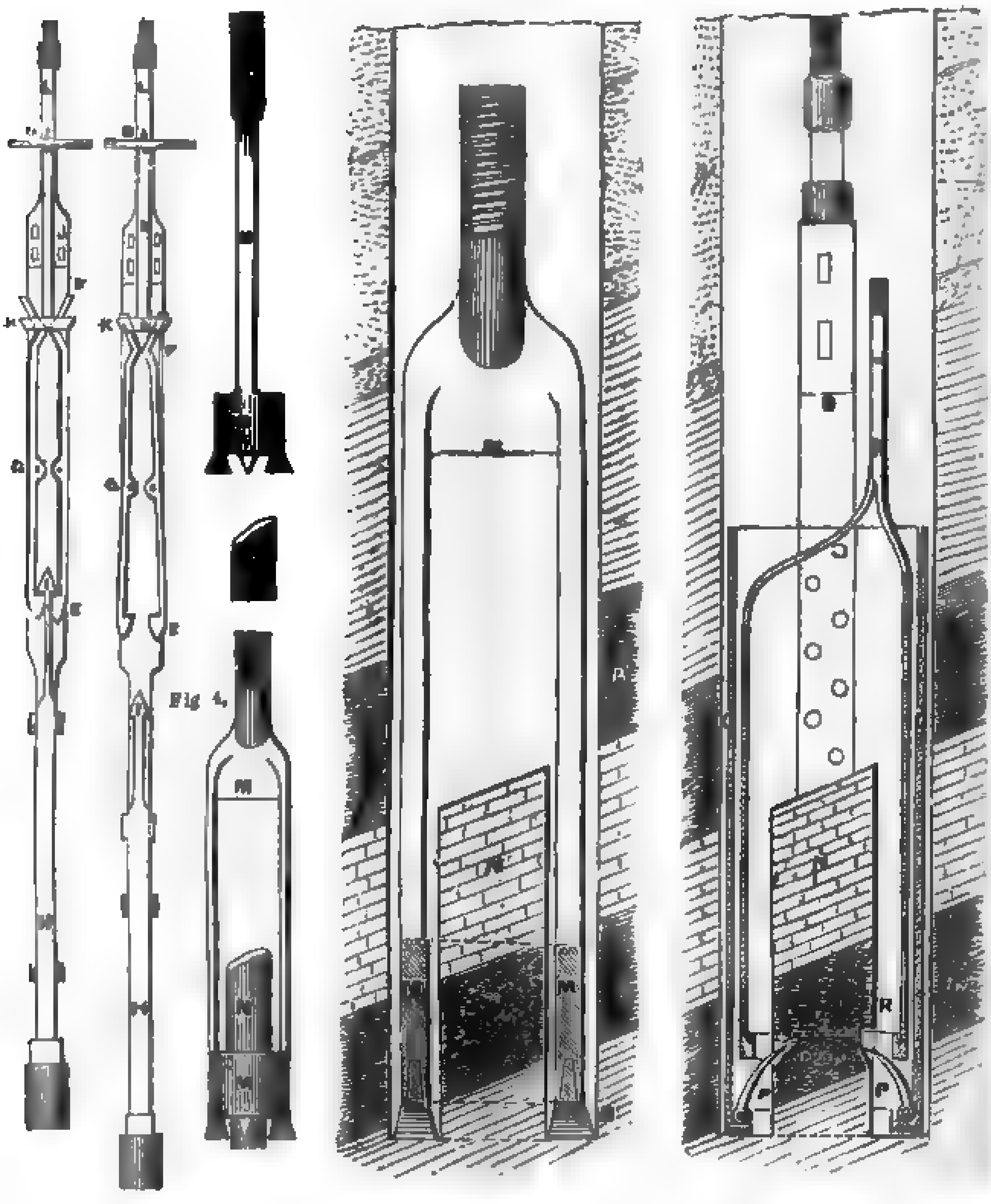
# Mechanics' Magazine.

No. 1635.] SATURDAY, DECEMBER 9, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## KIND'S IMPROVED SYSTEM OF MINE-BORING.

Fig. 1. Fig. 2. Fig. 3. Fig. 5. Fig. 6.



## KIND'S IMPROVED SYSTEM OF MINE-BORING.

BY MR. SAMUEL H. BLACKWELL, OF DUDLEY.*

There are few processes of greater importance in a mining country, and especially in one in which mining operations have been carried on for long periods, than that of boring. In all mining districts, the operations are, of course, at first principally confined to the mineral formations, whether beds or veins, which lie near the surface, and thus disclose themselves readily to view. But as these formations are followed deeper and deeper, and surface indications no longer act as guides, or only partially so, it becomes of the greatest importance that some easy and economical method should be employed, for the purpose of ascertaining whether minerals exist at points where no actual proofs of such have been given.

In England we possess mineral formations of greater value and importance than any other country, of equal area; these formations have been largely worked from the very earliest periods, and of late years to an extent which forms a completely new epoch in the history of industrial labour. The extent to which our known mineral fields are now being worked, and the dependence of the continued prosperity of the country upon the further development of our mineral resources, make it of the greatest importance to avail ourselves of every improvement in the cost and despatch of any processes having for their object the discovery of new mineral fields.

The principal means of effecting such new discoveries is that of boring; and yet far less attention has been paid to the improvement of the process of boring in this country than on the Continent. The old processes are still almost universally employed; they are costly, not only in expenditure of money, but still more in the time they require, which is oftentimes of even greater importance; they are also uncertain in their results, and in the knowledge which they give of the character of the measures passed through. These defects in the present processes often lead to the risk of expensive sinkings being preferred to the delay and uncertainty of boring, under circumstances in which, if economy, despatch, and certainty could be insured, boring would be invariably adopted.

The defects of the present English system arise from the permanent attachment of the boring chisel to the rods which are employed to lift and lower it; the blow is thus given not simply by the chisel itself, but by the entire length of rods and the chisel, forming together one single tool. When great depths are attained, the jar and vibration communicated to the rods through their entire length, by their fall and the percussion of the chisel, are so great as to require corresponding strength and weight of material. The space through which the rods are allowed to fall, must under these circumstances necessarily be small, as no strength of material would long withstand the constant jar and vibration consequent upon a fall through any great space, and thus in practice, a fall of a few inches only is all that is obtained. The strength and weight of the rods are also limited by hand power being generally employed. The chisel used is thus always small, and the bore-hole correspondingly small, giving rise to much friction against the sides, and rendering the indications of the measures passed through uncertain, from their being ground up, more or less, by the action of the chisel.

Kind's improved system of boring—the subject of the present paper—remedies all these defects. The tool is free, and is attached to the rods simply whilst being lifted; the lifting can be effected to any height required, and when so lifted, the tool is detached from the rods, and falls freely by itself. It is then followed by the rods, which pick it up, and lift it again, for another fall. The rods may thus be made light, and the tool heavy, no vibration or jar being communicated to the rods by the percussion of the fall. The tool can be made to fall through any amount of space, and the impetus thus obtained gives corresponding rapidity to the work performed. Large bore-holes may thus be made, and cores of 6 to 10 inches in diameter taken out, so as to show the precise character of the beds passed through, and their exact kind of stratification.

These results will be apparent on reference to the accompanying drawings, showing the character of the tools employed.

Figs. 1 and 2 show the lower part of the rods, L, on which the bar or slide, N, (attached at its upper end to the piston, D, and at its lower end to the wedge and ring, K,) has the power of a slight upward and downward movement, so as to open or close as it ascends and descends, the fangs, E F, working upon the central pivots, G. When the fangs, E F, are closed by the downward pressure of the wedge and ring, K, they firmly grasp the head, I, of the tool, H, as in fig. 1. When the fangs, E F, are opened by the upward pressure of the wedge and ring, K, the tool, H, is loosed by the fangs, and

* The substance of a paper recently read before the Institution of Mechanical Engineers, Birmingham.

entirely detached by its own weight, as in fig. 2. The opening and closing of the fangs, E F, are effected by the action of water in the bore-hole, pressing on the piston D, either on its upper or lower surface. If the tool be resting on the bottom of the bore-hole, detached from the rods, as shown in fig. 4, as the rods descend to pick it up, the pressure of the water upon the piston, D, is on its under surface, and consequently the wedge and ring, K, are raised, and the fangs, E F, kept open, as in fig. 2. When the rods come completely down, the open fangs descend over the top of the tool, H, and on being quickly lifted, the pressure on the piston, D, is reversed; the wedge and ring, K, are pressed down, and the fangs, E F, are closed, as in fig. 1, embrace the tool firmly, and lift it with the rods, opening again to allow its fall, when, after being lifted as high as may be required, the motion of the rods is reversed, and the pressure once more thrown upon the under surface of the piston, D. Chisels of any required form may be screwed into the tool, H, either to cut away the whole material of the bore-hole, or to leave a solid central core, N N. When these solid cores are required, they are extracted by the tools shown in figs. 3, 4, 5, and 6.

Fig. 7.

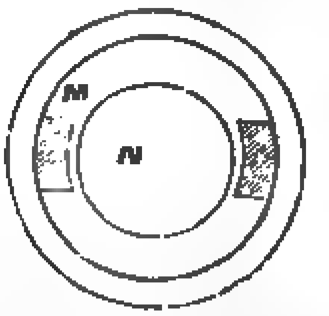



Fig. 8.

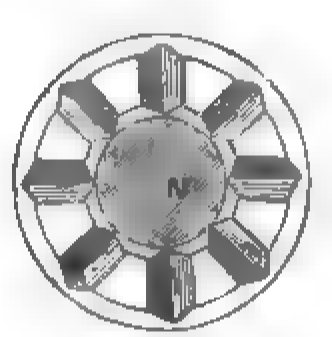
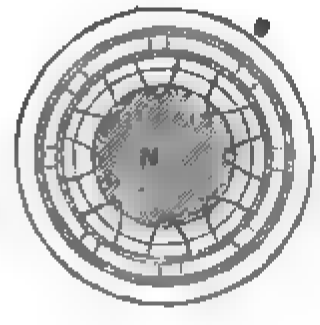



Fig. 9.




The first tool employed, M, figs. 3, 4, and 5, is a crown borer, which being armed with five or more chisels, shown in fig. 8, makes by percussion, as already described, a circular cut to the required depth. This crown borer is then removed, and the second tool, O O, fig 6, lowered to the bottom of the core thus formed, and the curved teeth, P P, slide down the surface of the core. An interior cylinder, R R, previously suspended by a cord, is then lowered, so as to press the teeth inwards; a few short strokes are given to the rods, by which the teeth groove themselves into the core, and then by a sudden jerk the core is detached and brought carefully to the surface.

After the reading of the paper, Mr Blackwell exhibited two specimens of the solid cores that had been cut out and raised by the apparatus; one cylindrical piece of salt rock, $5\frac{1}{2}$ inches diameter and 12 inches long, from the Montmoret Salt Mines, in the south of France, at about 200 yards depth, broken off square at the ends: the other specimen was hard shale rock, from the coal measures, $7\frac{1}{2}$ inches diameter and 12 inches length, with the ends sloped off at an angle of about 45°.

The Chairman remarked that the specimens were very regular in form, and showed great perfection in the action of the tools; it appeared an excellent plan for examining strata, and must prove an important advantage in preventing useless outlay in sinking shafts in many cases, by the information afforded of the actual dip as well as formation of the strata.

The Chairman asked what diameter of bore-hole was usually accomplished?

Mr. Blackwell replied that in the new plan the hole was bored 10 or 12 inches in diameter, but many of the ordinary bore-holes were only 3 or 4 inches in diameter, except where the strata passed through required telescope tubing, wanting a larger bore to commence with.

The Chairman inquired whether any difficulty was found in boring through the coal measures by the new process, from the various hard strata to be passed through? and whether the tool could be changed, if required, on coming to softer measures, to take out the whole diameter at once without leaving a core?

Mr. Blackwell said the ordinary tool was best in boring through the softer strata, when samples were not desired, and it could be readily substituted for the other tool. There was no difficulty in boring through the coal, and in most strata the process was comparatively rapid, the boring in rock made slow progress, but with a heavy chisel and the blow of a 10 or 15 feet fall, the hardest rock could be got through, and any form or weight of chisel could be readily applied.

Mr. Lloyd asked whether the new plan of boring had been tried in England?

Mr. Blackwell replied that a trial had not yet been made of it in this country, though it had been in extensive use for some time on the continent; but he understood that Mr.

Wall, in London, had made arrangements for introducing the plan and granting licenses for its use.

Mr. Siemens observed that he was acquainted with the invention, and had seen the apparatus at work in several places in France for salt works. The process was very successful, and the work was accomplished with great precision and regularity; he had seen many specimens taken out such as those now exhibited, and the particulars and inclination of the strata were ascertained with great accuracy. The process was considerably superior in quickness and economy to the ordinary mode of boring, and the average cost of deep borings he understood was not more than one half; there were three bore-holes, of about 400 yards depth each, completed in two years, and without a single accident.

Mr. Cowper inquired how the crushed portions of the material were got out of the bore-hole, as the solid pieces only could be drawn out by the tool?

Mr. Blackwell said there was often found to be sufficient water rising in the hole to wash out the crushed material, otherwise water was passed into the hole in a stream sufficient for the purpose; if necessary a scoop could be employed as in ordinary boring, but this was not generally requisite.

Mr. McConnell observed that it was an important object to ascertain accurately both the direction of the dip and the angle of inclination of the strata; and he inquired how the rods were insured against being twisted round whilst they were drawn up, so as to alter the original direction of the sample piece brought up? and also whether there would not be some risk of the bore-hole getting gradually inclined at the lower part from the original vertical position when the strata were much dipping and the hole happened to be rather harder on one side, which would cause an error in the measurement of the inclination of strata from the sample brought up?

Mr. Blackwell replied that the rods were effectually prevented from twisting by passing through a fixed guide at top; the whole process required more care than the ordinary boring when the dip of the strata had to be measured, but no difficulty was found in getting correct results by taking the average of the several specimens, as any errors were then practically neutralised, and the actual dip of the strata would not change perceptibly in a distance sufficient to afford a correct average result. He thought the heavy tool falling freely from a considerable height at each blow in cutting out the hole, would always prevent any material deviation taking place from the vertical direction.

The Chairman said he thought it was a very ingenious improvement on the ordinary process of boring, and likely to prove of much advantage, and he hoped that Mr. Blackwell would soon have an opportunity of testing its merits by an application in this country.

## ON PRODUCTS OBTAINED FROM COAL.

BY PROFESSOR CRACE CALVERT, F.C.S., ETC.

(*Concluded from page* 533.)

The next products he should mention which were distilled from coal, were those which had the name of light oils of tar, which remain on the surface of water.

* * * *

There existed in these light oils of tar a product highly interesting, called tar creosote, or carbolic acid, which possessed extraordinary antiseptic properties; such, for example, as preventing the putrefaction of animal substances. He (Mr. Crace Calvert) had applied it with success in preserving bodies for dissection, and also in preserving the skins of animals when intended to be stuffed. Owing to its peculiar chemical composition, he had also employed it successfully of late in the preparation of a valuable dye-stuff, called carboazotic acid, which gave magnificent straw-coloured yellows on silk and woollen fabrics. The carboazotic acid prepared from the above-mentioned substance could be obtained very pure, and at a cheap rate, thus enabling the dyer to obtain beautiful yellows and greens, which were not liable to fade by exposure to the air, as was the case with most of the yellows and greens which were obtained from vegetable dyes. The advantage of the carboazotic acid, so prepared, was, that it was entirely free from oily or tarry substances, which had the property of imparting a disagreeable odour to the dyed fabric. The intense bitter which the acid possesses had induced him to have it tried as a febrifuge; and Dr. Bell, of Manchester, had succeeded in curing several cases of intermittent fever, by its aid, in the Manchester Infirmary. He had also placed some of this substance in the hands of eminent physicians throughout the country, and he hoped shortly to ascertain that it was of real value as a substitute for that expensive medicine, sulphate of quinine.

He had lately applied carbolic acid in a manner that offered advantages to dyers and calico-printers. It was well known that extracts made from tanning matters could not be kept for any length of time without

undergoing deterioration, in consequence of the tanning matter which they contained becoming decomposed and transformed by a process of fermentation into sugar and gallic acid; which acid, he had ascertained, not only had no dyeing properties, but that, on the contrary, it was injurious, from having a tendency to remove the mordants which were employed to fix the colours on the cloth. It was also known that gallic acid possessed no tanning properties. By adding a small quantity of carbolic acid to the extracts of tanning matter, they could in future be kept and employed by the dyer as a substitute for the substance from which they were obtained—by which would be gained the double advantage of saving labour and obtaining a better effect from the tanning matters.

The third substance which passed off in the distillation of tar, was called heavy oil of tar, which was used by Mr. Bethell as above stated. This substance contained a singular organic product, first discovered by Dr. Hofmann, of London, and called by him "kyanol" or "aniline," which possessed the property of giving, with bleaching-powder and other agents, a magnificent blue colour. This fact led him (Mr. Calvert) to observe that this last-mentioned substance, as well as carboazotic and indigotic acids, being produced as well from indigo as from coal-tar, proved the great similarity and chemical connection which existed between the products of tar and those of indigo, and induced him to believe it extremely probable that those products would be employed within a few years as substitutes for indigo and madder. Laurent had succeeded in obtaining two products from napthaline, which had a great analogy to the colouring principles of madder. A substance, for instance, called chloronaphthalic acid, had the same composition as the colouring matter of madder, and would be identical if the hydrogen gas was substituted for the chlorine which the acid contained. Hence the chloronaphthalic acid had the property of giving with alkalies a most superior red colour.

When the colouring principle of madder was treated with nitric acid, a substance called alizaric acid was obtained, which was identical with a substance also obtained from napthaline, called naphhthalic acid. Naphthaline was a solid white substance, which distilled in large quantities during the distillation of tar.

An interesting fact had been discovered by Mr. James Young, of Glasgow, namely, that if coals were distilled at a low temperature, the products obtained were different from those which were produced when coals were distilled at a high temperature, as was the usual custom in the manufacture of gas. Without entering into all the details on this point, he would mention one of the most striking differences of results, namely, that Mr. Young obtained in place of the naphthaline a valuable lubricating agent, called paraffine, a solid substance, and a large quantity of carburetted hydrogens were also distilled, which, being free from smell, were valuable for commercial purposes, and had received the general name of paraffine oil; or, as Dr. Lyon Playfair remarked, in his report of the Great Exhibition of 1851, it was "liquefied coal gas." This paraffine oil, when mixed with other oils, was now most extensively employed in the cotton-mills of Manchester and the neighbourhood. Solid paraffine was also obtained in the distillation of peat, and was employed for manufacturing candles, there being added to it about 20 per cent. of wax. These candles were remarkable for their transparency and the pureness of their flame.

## RYDER'S PATENT.

## IMPORTANT DECISION OF THE PRIVY COUNCIL,

*December* 1, 1854.

(*Before the Right Hon. the Chancellor of the Duchy of Cornwall, the Right Hon. Sir John Patteson, and the Right Hon. Sir Edward Ryan.*)

This matter came before the Court on an application for a renewal of a patent, and derives its importance from the fact that it elicited the decision of this high tribunal on the rights of patentees in reference to a prolongation of their patents.

Mr. Atherton appeared on behalf of Mr. Ryder, and the Attorney-General on the part of the Crown.

Mr. Atherton applied, on behalf of Mr. Ryder, a roller and spindle maker, at Bolton, in Lancashire, for a prolongation of the patent, for a certain improved apparatus for the manufacture in metal of rollers and bolts for spindles, and other articles connected therewith—the letters patent extending over 14 years, bearing date February, 1841. The learned counsel having described at some length the nature of the invention,

The Chancellor of the Duchy of Cornwall inquired what was the total amount of the profits accruing to the patentee, making deductions for the trade profits?

Mr. Atherton replied that the total profits were £3,425; but there was this important fact, that £2,131 of that sum had accrued during the last four years, so that practically, though the patent had extended over

14 years, their lordships would find that Mr. Ryder had had the benefit little short of half that period. The invention was admittedly of great importance, and there was this strong circumstance—that the use of the machine from which the profit had arisen was exceedingly limited.

The Chancellor of the Duchy of Cornwall—What was the total amount of the profits, supposing he granted no royalties? I understand from the case that he granted licenses to different parties whom he charged with royalties. He treated the machines he had made and used as if they had been made by a third person, and he charged the same royalty on them, so that whatever profits he made as a machine maker are not included?

Mr. Atherton—No; and for this reason—that if he had not employed his workmen and means on those machines he would have employed them on others.

The Chancellor of the Duchy of Cornwall having called for the accounts,

Mr. Atherton said he would lay three accounts before their lordships. There was one showing the net advantage of the invention, and another showing the profits of the machine in gross, whether by royalties or not; then there was another account, with the difference between the two. No doubt there had been a profit, which was not a bagatelle; but the test, he would suggest, was a double one. Firstly, during what period of the 14 years there had been a profit to the patentee, and secondly, over what extent of country the machine had been used. There had been, undoubtedly, a great profit during the last four years, but there had been a very limited use of the machine, which was so novel and so useful that, if generally used, it would be of the greatest advantage. Although Mr. Ryder was in pocket to some extent, the advantage he had derived was much below that which it might be reasonably supposed he would have acquired by an exclusive right.

The Chancellor of the Duchy of Cornwall — The law was introduced to give a sort of legislative power to this Court, to prevent parties from applying for an expensive Act of Parliament. The question is not whether or not we may think that a man may be entitled to a larger remuneration. He appears to have reaped an advantage of nearly £7,000 by this invention. The question for us is, has he received a remuneration for his invention sufficient to repay him for his skill, labour, and expense? There has been less expense in this case than I have ever known—there has been really no expense. Then though, upon the whole, he has made his profit partly by trade profits, he could never have sold his machines but for his patent. The machine deserves the highest approbation; but the question for us is, is there anything in this case to bring it within the unusual and extraordinary principle? Here is a profit of from £6,000 to £7,000 accruing to the patentee, though he was subject to no other difficulty than applies to all cases where machinery is attempted to be substituted for labour.

Mr. Atherton said that if their lordships would permit him to adduce evidence, they would find that the machine had been of greater advantage to those who had used it than to the patentee. Suppose no prolongation of the patent were granted, the moment that happened the whole of the manufacturers of Sheffield might avail themselves of this useful machine, and apply it, on the largest scale, to the most important manufactures, so that the inventor would not receive the advantage of a single farthing.

The Chancellor of the Duchy of Cornwall—We take all you state as capable of proof; but the question is, have the profits of the invention been commensurate with the skill, labour, and expense attending on it?

Mr. Atherton said that Mr Ryder had been engaged four or five years in perfecting the invention, and he would, with their lordships' permission, produce evidence on that point.

The Chancellor of the Duchy of Cornwall—I am sure, Mr. Atherton, you do not think it right that the Court should be occupied with evidence that cannot affect their decision. In all these cases where the invention is of value the Court requires the accounts to be produced; and if it appear on the accounts thus made out that the party has received a remuneration which, in the opinion of the Court, is commensurate with the skill, labour, and expense attendant on the invention, then the Court will not grant a prolongation of the patent.

Mr. Atherton—The machine has not been used at all in Scotland.

The Chancellor of the Duchy of Cornwall—You have done all you can, Mr. Atherton, and we are all of opinion that you have not made out a case for the prolongation of the patent.

Application refused.—*Morning Post.*

## UNSAFE PASSENGER-SHIPS.

The news of the loss of the *Tayleur* naturally caused very great sorrow amongst the colonists of Victoria, many of whom had near and dear connections sacrificed in that fated vessel. And an opinion gains ground that proper precautions are not taken to secure all reasonable safety to vessels by

which such large numbers of lives are jeopardised. We have proved this want of thought or want of conscientiousness in some respects already, and therefore we have a perfect right to suspect it in others. When ships used to arrive here impregnated with fever, and numbering their dead by scores, we protested loudly against such wanton and unnecessary sacrifice of life. Better precautions have since then been adopted, and the same ships have again arrived *without losing one life by disease.* How strongly this shows the preventible nature of many of the causes of mortality! We have since attracted attention to the careless selection of captains and other officers of vessels, and we did not hesitate to characterise as *murderers,* owners or charterers of vessels, who entrusted them with large numbers of passengers on board, to ignorant, brutal, or drunken men.

But the mode of constructing ships may be as defective as their sanitary arrangements, or the selection of those to whom they are confided; and this has been forced upon the attention of the colonists (although it may have escaped that of residents in the mother country) by the indefatigable efforts of a gentleman resident amongst us, and who loses no opportunity of enlarging upon the occasion of every wreck, as a proof of what he calls the "national sin" of sending large numbers of persons to sea, in vessels essentially unseaworthy. Mr. Ballingall traces the practice of defective ship-building to the present system of insurance. He says, "A mode of ship-building, causing unsafe vessels to be built, is prescribed by an irresponsible body, making it the interest of a shipowner to possess himself of an unsafe in preference to a safe vessel. This is effected by the vicious custom of marine insurance, which pays in full for a total loss, but pays only two-thirds of the loss sustained for a partial loss. Hence, all shipowners who have their vessels insured, prefer total to partial losses. The contrast between comparatively safe and unsafe vessels is shown by a comparison of our royal and mercantile navies. In the former, vessels are built with due regard to safety; and when they are lost, if the persons who were in charge survive, they are subjected to a rigorous trial by persons competent to judge; and if blame attaches to them in anywise, they are broken out of the service, and probably imprisoned besides. These vessels are not insured, hence all due precautions are taken for their safety. In the mercantile navy, where the vessels are insured, no investigation worthy of the name takes place after a loss."—*Melbourne Argus.*

In another number of the *Argus,* Mr. Ballingall writes: "I hope that the opportunity will not be lost, of the excitement existing on account of the great loss of life by the *Tayleur,* to investigate into the structure, not only of that vessel, but the structure of merchant-ships generally, whether they are built of wood or of iron, where loss of life has arisen from their wreck. Were this carried into effect, and a law passed that vessels of imperfect structure, whether of wood or iron, should not be registered, it would diminish shipwrecks and the losses of life arising therefrom by one-half. In the case of the ill-fated *Orion,* although the London *Mechanics' Magazine* stated that the vessel could not have been efficiently divided into water-tight compartments, no notice was taken of the remark. Nor, on the trial of the captain and second mate, was a single question put of the thickness of the plates forming the bottom of the vessel, nor indeed of her structure in any way. It appears that a model was exhibited by the builder of her, and not a question was asked relative to her. This was no investigation at all into the safety of the vessel."

## ON THE PRESERVATION OF WOOD; AND THE USE OF PITCH IN SHIPBUILDING.

BY MR. J. BETHELL.*

THE possibility of the preservation of wood by tar oil had struck him (the author) whilst seeking for some material to preserve wood for railway sleepers. The stone sleepers originally laid down were found to destroy the carriages very quickly; and it being desirable to use some softer material, wood naturally presented itself. How to preserve it then became a question, and it was proposed to use solutions of various chemical salts. It was considered that the decay of wood was principally caused by the albuminous nature of the sap, and that if some matter could be obtained to coagulate it, the decay would be stopped. Corrosive sublimate and sulphate of copper were therefore tried for this purpose. It was found, however, in practice, that this process was too expensive, and besides, although it prevented the putrefaction of the sap, it had no effect on the fibrous matter of the wood. He then determined to try the oil of tar, and he was induced to do so from finding that the agents used to preserve the Egyptian mummy were of an asphaltic nature—asphaltic oils being collected in great quantities on the Persian Sea, and in different parts of

* The above remarks were recently made by the author during the discussion of Professor Calvert's lecture.

Egypt, where, in consequence of the heat, it exuded through sandy rocks, &c. Finding that this substance was used for making mummies, he considered that what would preserve animal flesh would preserve wood. He therefore determined upon using oil of tar, and then came to be considered the mechanical method of making the wood absorb it. He found that where wood had been used perfectly dry, it stood uninjured, if protected from the weather, for ages, as was to be seen in the roof of Westminster Abbey; and he determined so to saturate the wood with oil of tar as to render it impervious to water. The result had far exceeded his expectations. A few days ago some sleepers were taken up between Manchester and Crewe, which had been laid down in 1838, in order that they might be replaced by some of a heavier description, when it was found that the old sleepers were perfectly sound, and they were about to be used on parts of the line where there was less traffic. The unprepared sleepers never lasted more than four or five years. A great many improvements in this country were stopped by the prejudice which people had against anything bearing the smell of gas. For instance, pitch and other products of tar were highly important in ship-building, yet so prejudiced were the English shipwrights against coal-tar and pitch, that they would only use the tar and pitch from Archangel or Stockholm, though it cost ten times as much as the English. In the Mediterranean the native vessels which were not coppered suffered very severely from the worm, and the Maltese and Sicilians found that the Archangel and Stockholm pitch would not protect them; but with the coal-pitch and tar no worm would touch the vessels, and there was, therefore, a great demand for the English pitch and tar in the Mediterranean, the boatbuilders of which would readily give more for it than for the vegetable pitch or tar; but there was a prejudice against it in England, because it was to be obtained cheaply at our very doors. In fact, all pitch and tar from the mineral kingdom was much better and stronger than that from the vegetable, and much more of a preservative.

## NEW MIDLAND CANAL.

Extraordinary as it may appear in the present railway times, a new canal is about to be cut in the heart of the manufacturing districts. The object is to unite Oldham with Manchester by canal; and the land for the purpose has been arranged for with the owners, and all the preliminaries agreed to. The design is to carry the canal from Oldham to near Middleton, where it will form a junction with the Manchester and Rochdale navigation. The distance is four miles, and the ground so very unfavourable, that nine locks will have to be erected in that distance. It will run about parallel with the Lancashire and Yorkshire Branch Railway line from Middleton to Oldham, and has been undertaken because of the alleged inadequacy of that railway to supply the wants of the manufacturers of those towns. It is clear, from this enterprise, that the war in which we are now engaged is not paralyzing our trade and manufactures—is not diminishing employment.—*Civil Engineer and Architects' Journal.*

## MR. WAUGH'S WORK ON THE CALCULUS.

*To the Editor of the Mechanics' Magazine.*

Sir,—Some of my letters questioning the statements of your correspondents, have had the honour of insertion in your much-esteemed Journal: at present I venture to request you, by an extension of your usual courtesy, to admit a few remarks in some degree opposed to your review of Mr. Waugh's Essays, &c., in your last Number.

In the illustration of an ultimate ratio by the two stones thrown against a wall, I think there is a want of propriety; because in all the cases of ultimate ratio dealt with in the calculus, we have the two quantities compared *gradually* decreasing and vanishing together; whereas, in this case, the two velocities are both suddenly destroyed. Now to me this increases the difficulty of conceiving the ultimate ratio of the two velocities. And indeed I cannot at all agree with you, when you say that the ratio of $(\delta y)$ to $(\delta x)$ when both vanish, does not present itself to our minds so clearly as the ultimate ratio of the velocities of the two stones. I have (and I think not unreasonably) quite the opposite opinion. The only other point I wish to mention, is the objection of Berkeley. It seems to me, that very few who understand the calculus at all will fail to see immediately that the sophism lies in the objection, and not in the reasoning objected to. Every mathematician knows that the conclusions drawn by supposing the increment of $(x)$ to vanish, do not in any way depend on the preservation of that hypothesis of increase, as he insists. It would be as reasonable to object to the truth of a proposition in Euclid, because the construction, by aid of which it has been proved, has been rubbed out. Of course we are as free to suppose $x$ to diminish again after an increase as we were to suppose the increase itself. Berkeley's objection is a play on

words. And it seems Mr. Waugh has made himself most absurd in attempting to meet it on ground which it does not occupy. Your criticism on it, so far as I can read it, seems to me most just and admirable. It is of the greatest importance that persons incompetent to treat a subject of the kind should be prevented, as far as possible, from adding to its real difficulty by their absurd attempts to simplify it.

Again asking your indulgence for my present liberty, I remain yours, &c.,

A MECHANIC.

[To go fully into the subject of our correspondent's remarks, would literally require a volume, and even then leave room for further criticism. We can only take a very brief, and probably unsatisfactory notice of his two objections to our review.

(1.) The first objection, as to the perspicuity of our illustration of Newton's views of an ultimate ratio, is "its want of propriety," because in it the velocities of the two stones are *suddenly destroyed*, whereas in the calculus all quantities are supposed to increase or diminish *gradually*. It is perfectly true that in the calculus quantities *are* so considered; but our illustration was designed simply and solely as an illustration of an *ultimate ratio*, without any regard to the circumstances under which it was obtained. In fact, our correspondent is making use of our own words, when he points to the *difference* between the case of the two velocities and the application of the calculus to curves, &c. We expressly pointed out this difference, as rendering Newton's illustration inapplicable to such cases as the latter. But when our correspondent asserts that he has as clear or even a clearer notion of a vanishing straight line (such as the increments of the abscissa and ordinate,) than he has of a vanishing or ultimate finite velocity, such as that of the two stones—we think he must have made the assertion rashly and without due reflection. Every one can understand that a stone may have a velocity of, say a mile a minute, at the very instant of its being suddenly stopped. But he neither has, nor can have, so clear a conception of the ultimate condition of a straight line in *its* vanishing state. Newton's illustration, in reply to objections, is, in fact, an appeal to the clearer notions we have of velocity as a continuous variable to what we have of straight lines in their vanishing state. The objection to Newton's illustration is, that it contemplates *finite* quantities—such as the velocity of a stone suddenly arrested by a wall—whereas the application of the calculus is to *infinitesimal* quantities, or quantities which are *not* finite. If our correspondent only objects to the illustration *on this ground*, he is doing precisely what we ourselves did in the review. But if he rests his objection on the want of clearness and distinctness in the idea of an ultimate finite velocity—all we can say is, that he cannot have sufficiently reflected on the matter.

(2.) The objection of Berkeley has never, that we remember, been called "a mere play on words" before. Our correspondent cannot know much of the History of Mathematics, or he would never have said that "*very few* who understand the calculus at all will fail to see immediately," &c. There is no writer in the English language who has done more for the mathematical student than *Woodhouse;* no one who understood better what he was writing about, or who stands higher as an original writer on mathematics: and yet he distinctly admits the main charge brought by Berkeley. Our correspondent's comparison of the "rubbing out a figure of Euclid" is, we must say, as extraordinary and strange as anything in Mr. Waugh's book. We feel confident that when he comes to consider the subject more carefully, he will see the absurdity of it, and also the real difficulties of which, at present, he does not seem to be aware.—*Ed. M. M.*]

## SMOKELESS FURNACES.

*To the Editor of the Mechanics' Magazine.*

SIR,—Active measures being now taken under Lord Palmerston's act for the abatement of the smoke nuisance, the means for effecting that abatement have acquired an increased interest in the public mind. Anxious to see the object of the act accomplished, I am equally so to assist the well-intentioned smoke producers, and relieve them from the costly quackeries of the "Smoke-consuming," and hot-air fallacies of the day. It is indeed impossible not to commiserate the position of a manufacturer who, willing to avoid being a nuisance to his neighbourhood is, nevertheless, left in the dark by the legislature as to the means by which he can avoid the penalties of the law, so strictly enforced, and for an offence so new, so undefined, and of so questionable a character. The result is, that in the absence of legal authority or advice, as to the means they should adopt, while the magistrates insist on carrying the act into force, the unfortunate manufacturers have no alternative, and are literally driven into the hands and meshes of the "smoke-burning" patentees, and fall an easy prey to their exactions. This also becomes the more vexatious and embarrassing, seeing that these patentees are at issue among themselves,

each advertising his own panacea as the only "cure for smoke." Indeed at this moment we have one class advocating costly expedients for the combustion of the *incombustible* smoke; and another stunning the public with schemes for the use of hot air, although in direct opposition to the dictates of nature, and the lights of chemistry.

In reference to Mr. Woodcock's patent furnace, and the aid Mr. Mansfield has given in leading the public astray, these observations are in point, the magistrates absolutely requiring that some "smoke-burning" apparatus be adapted by the owners of furnaces. It is however idle for them to allege that Messrs. A, B, or C "had employed means for *consuming* (they might with equal propriety, say *eating*) their own smoke." The numerous schemes of the modern patentees having no common, intelligible, or sound principle, and in truth going contrary to nature, are necessarily as uncertain in their effect, as they are inapplicable to the various classes of furnaces. An apparatus of this doubtful character, applied to one class, size, or description of furnace, may be an alleviation of the nuisance of smoke, yet utterly inapplicable and useless when applied to another class. On this, however, these patentees are cautious and silent. They are lavish in advertising individual instances of success, but prudently avoid noticing their numerous failures, or the extent to which their unfortunate dupes have been mulcted.

I now continue my remarks on Mr. Mansfield's letter, advocating Mr. Woodcock's furnace. "This invention," he says, "consists of two parts. The first is a double set of thin iron bars (or rather plates), lying horizontally parallel to each other, immediately beneath the grate, in the ash-pit. Each set resembles a Venetian blind. The effect must be, to screen the ash-pit from all heat radiated downwards. In fact, not a ray of heat can reach the ash-pit." Again, "The air, *not being heated*, enters the fire *cold*, and therefore, not, as in the ordinary ash-pit, in a rarefied condition; and, by *reason of its coldness* and its unrarefied state, produces a more intense and rapid combustion." Now, however this costly and inconvenient apparatus may keep the ash-pit cool, it has no relation whatever to the preventing the generation of smoke. It is here worth noting the contradictions and confusion into which these theorists fall when they neglect what nature demands in effecting combustion. Mr. Mansfield dwells on the value of keeping the air *cold*, by the interposition of these double Venetian blinds. Mr. Prideaux, adapting these identical blinds, insists, on the other hand, on their effect in causing the air to be intensely *heated*. Who, then, shall decide when *such* doctors disagree? In truth, the unfortunate and suffering public are left to make their choice of having cold or hot air, and by the same apparatus, the interposition of the Venetian blinds. Blinds in truth they are, keeping their dupes in utter darkness on the subject.

Mr. Mansfield then goes on, "The second part of this contrivance is, that which is more especially the smoke-burning apparatus." He then describes, minutely, the two tubes, one on each side of the furnace, by which the air is brought to the gas at the bridge, independently of the current of air in the ash-pit (as specially directed in my patent of 1839). He next describes, and also much in detail, the double bridge, its action and supposed influence. Now all these costly and complicated appendages have no connexion whatever with producing combustion; their sole effect, and that for which, no doubt, they were contrived, being, to give a *quasi* importance to the arrangement: to increase the expense, furnish an excuse for high charges, and give a colour to the pretensions of the patentee for invention and originality.

After this detailed account of these unprofitable parts, he at length comes to that on which the merit depends, and which involves, exclusively, the effecting perfect combustion, without smoke. This, however, is prudently slurred over, and confined to the following two meagre lines: viz., "The back wall or plate, both of the upper and lower part of the chamber or bridge is perforated with numerous holes." Not a word have we as to the cause of the perforations, or other intended effect, or why this perforated plate is introduced at all. Now, is this honest, is it creditable to Mr. Mansfield? The design, however, of the omission is palpable enough. To have said any thing on the subject of this plate and its perforations, would have exposed the whole trick, and have dissipated all claim to originality or patent right. It becomes a duty therefore to put the public right in this matter, and to let them know they may introduce the perforated plates into their furnaces (and on which the whole depends for success), without the aid or leave of Mr. Woodcock. Of the modes of applying these diffusion plates, see numerous examples in chapter vii. of my Treatise.

But now for the *experimentum crucis*; either remove the perforated plate, allowing all the rest to remain, double bridge, tubes, Venetian blinds, and all; or, *vice versâ*, remove all these latter "contrivances," and let the perforated plate remain. In the first case, the Woodcock furnace will fall back into the regular smoke-making ranks. In

the other case, perfect combustion will be effected, and without smoke. Can demonstration be clearer? This garbled description of Mr. Mansfield, then, lays him open to the charge, either of being ignorant of the object or effect of these perforations (as he has shown himself ignorant of the use of the perforations in the common gas Argand burner); or, of having lent himself to this most deliberate deception, leading the public to think Mr. Woodcock's furnace had merits which would justify his claim to patent right, and to whatever amount of charges he might exact.

I am, yours, &c.,
C. W. Williams.

P.S. Your Number of this day is just come to hand, and by it I see Mr. Mushet has brought his valuable aid to the disabusing the public mind on this subject. His letter on "the Combustion of Incombustibles" is conclusive and fairly brings Mr Woodcock to the test, when he asks for "details of his experiments for ascertaining the heat imparted to the air which passes through his tubes."

Liverpool, Dec 2, 1854.

## ON THE ROTATION OF THE MOON.

*To the Editor of the Mechanics' Magazine.*

Sir,—I have read the letters on combustion lately written by Mr. Mushet, and published in your Magazine, with considerable interest. In these he and Mr. Williams plainly have the best of the discussion; and I think they have assisted others as well as myself to a better understanding of the conditions necessary to perfect combustion. Hence I experienced some natural surprise when I read, in your number of Saturday last, his letter on the motion of the moon. Every aspect of this letter shows that he is not writing on a subject with which he is familiarly acquainted. He does not express his meaning clearly, and his *apparent* intention is incorrect and untrue. In the first sentence he says:—"The assumed law of the revolution of the moon round the earth is based on a physical impossibility." Here he cannot mean that it is impossible that the moon should revolve round the earth once in twenty-eight days; yet this is the law that his words describe.

The point of his letter lies in this sentence.—"If the moon always presents the same face to the earth, it *does not revolve on its axis at all.*" I shall attempt to prove that, with the same hypothesis, the moon must move round a line passing through its centre of gravity, both in the scientific and popular sense of the words. It will be more satisfactory to Mr. Mushet to give the first place to the popular and practical view of the question. There is a numberless variety of machines in which this same thing is exhibited and illustrated. The crank of the common winch, which is turned by hand, is a very familiar instance. Here, as with the moon, the same side of the body is always presented to the centre about which the whole revolves. Now when a person is turning a winch of this character, his hand moves round the centre of the axle, but the hand has no rotary motion whatever: for its various parts continue to occupy the same relative positions, always having the same fixed bearings from each other. But this is not the case with that part of the handle which is grasped; for it can be felt turning round in the person's hand, precisely as if that hand were held stationary, and the handle turned round in it as the axle is turned in its bearings. We may go to the steam engine, and see precisely the same thing. Both the head of the connecting-rod and the crank-pin may be said, in popular language, to move or revolve round the centre of the shaft; yet it is tolerably plain that the pin possesses a motion which the head of the rod has not, which motion has precisely the same relation to the head of the connecting-rod as that of the shaft has to its bearings. Thus we may say that the said pin has two motions—one the same as that of the head of the connecting-rod, and one the same as the shaft has in its bearings. In this way, whenever a body has a rotary motion—that is, whenever its parts have a relative motion, any particle of that body may be regarded as rotating about any line perpendicular to the plain parallel to which this relative motion takes place.

All this, Sir, begins to look so much like proving that one and one are two, that I am afraid of being impertinent in proceeding further. However, I will just say that whenever the parts of a body have any motion which differs from that of its centre of gravity, the body then has a rotary motion about that point. When all its parts have the same motion as the centre of gravity—that is, always stand in the same direction from it—then the said body has no rotary motion.

I am, Sir, yours, &c.,
J. C.

Deptford, Dec. 4, 1854.

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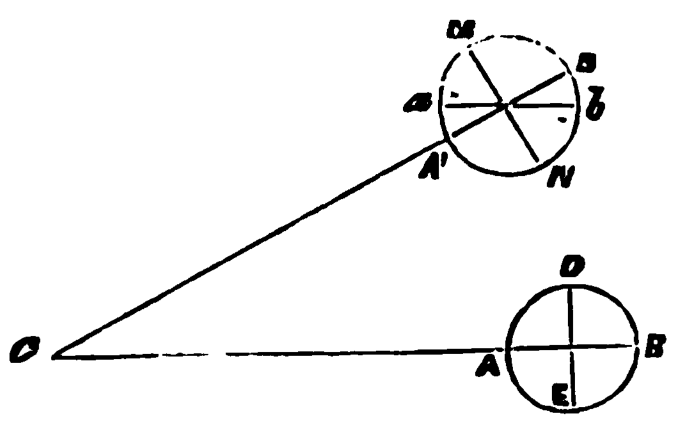
*To the Editor of the Mechanics' Magazine.*

Sir,—Your correspondent "David Mushet" is a genius. I know of no other discovery so wonderful, and withal so *truly simple*, as this of his and "Mr. Evan Hopkins" with respect to "The *Lunar* Revolution," excepting another (by some equally

great, though unremembered genius) with respect to "The Solar Revolution," and which was as follows. One of the "most important fallacies" taught in "the astronomical physics" of *his* time, "in all colleges and works on astronomy," was, that the earth revolved round the sun, and not the sun round the earth. This "most important fallacy" he easily refuted by pointing out that the reason why we do not see the sun actually go round the earth, is simply because he goes under the earth *in the night*, when, of course, he cannot be expected to be visible.

I am not a "profoundly practical philosopher" myself, but yet I think I can, without much trouble, exhibit the phenomenon which appears to Mr. Mushet a "physical impossibility," and without any apparatus whatever. Take an orange, or apple, or any thing you please, and just hold it out at arm's length, and carry it round as far as you can move your arm. The orange will be revolving round its axis all the while, and make one complete revolution whilst it is moved completely round your body (if the arm could make the complete circuit).

The "physical impossibility" would really be to make a ball revolve round another *with which it was rigidly connected*, without causing it at the same time to make a revolution round its own axis. The effect of the moon's revolution round its own axis is exactly what would be produced *if it were rigidly connected with the earth* (leaving out of consideration, of course, what is termed the *libration*.)




Suppose ABED to be the moon, AB any plane section of it. In the first position (the lower one in the figure) ADE is the visible hemisphere to a spectator at C, the earth. Now if the moon did *not* revolve round its axis, the plane A B would always remain parallel to itself, and when the moon arrived at the second position in the above figure, this plane would then be in the position *ab*. But in that case the visible hemisphere would now be MA'N (MN being perpendicular to the line joining the earth and moon); and this would obviously enclose a portion of the moon's surface, A'N, which was not visible in the former situation. But as we never do see such fresh portions of the moon's surface, the inference is that she does not move in such a manner as to keep AB parallel to itself; but that she has revolved round her axis through an angle equal to *a*PA'.

Let me add another illustration. As Mr. Mushet seems to be a "satellite" of Mr. Evan Hopkins, suppose the latter gentleman to stand in the middle of a room, while Mr. Mushet walks round him, always turning the same face to him. He will then likewise face all parts of the room in succession—exactly what would occur to Mr. Evan Hopkins *if he revolved round his own axis*, whilst remaining in his place.

These errors of the satellite and his primary, "absurd as they are," have not been so "long enthroned," I hope, as to require a "future generation to appreciate them," but will be obvious even to every

TYRO.

P.S. Tyro would be glad to learn if Mr. Evan Hopkins has also discovered, as an *important fallacy* that the moon's *sidereal* revolution is accomplished in 27 days, 7 hours, and about 43 minutes, and its *synodical* revolution in about 29 days and a half; neither one nor the other being 28 days? Or whether this last-named period is a new "revolution" effected by Mr. Evan Hopkins?

## ON CANAL LOCKS.

(See *ante*, pages 537-8.)

*To the Editor of the Mechanics' Magazine.*

SIR,—Before "J. L." undertook to speak of "confusion" and "erroneous conclusions," he ought to have been quite sure that he was not himself in error.

He admits that an *empty* barge will require just *one lock full* of water to float it to the upper level; he also seems satisfied that the *laden barge* will require *one lock full* + 50 *tons* to float it into the same position; and yet he confidently and strangely asserts just before that "this cannot be so."

If "J. L." will "only pursue the investigation a little further," he will find that the original question turned upon the *quantity* of water required in each case, whilst he himself has evidently confounded the *quantity of water* with the *difference of level* in the high water-mark—which, in fact, has little or nothing to do in the matter.

I would advise "J. L." to take the case as it naturally arises, and when he has followed the barge X''' to its destination and seen it lightened of its cargo, just to ask himself what has become of his *compensation?* He will then see who it is that ought "to look deeper into this matter" than has

already been done by at least *one* of your correspondents.

I am, Sir, yours, &c.,
T. T. W.

Burnley, Dec. 2nd, 1854.

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*To the Editor of the Mechanics' Magazine.*

SIR,—"J. L." has placed the canal lock question on a new issue in his letter inserted in your last Number. The original question as proposed by Mr. Wilkinson was correctly solved by that gentleman and Mr. Baddeley. Unquestionably, considering the case of a loaded barge ascending through a single lock, there is an expenditure of a volume of water equal to the barge's displacement in addition to the lock full of water, which will escape from the higher to the lower level, on the supposition that the floodgate communicating with the lower level is opened and the water escapes before a loaded barge *descends* through this lock.

The case of a loaded barge ascending a series of such locks is another and wider question.

Let us suppose the barge to be at the lowest level where the canal communicates with some river, as is usually the case, and where we may suppose the *level* always maintained. On passing through the first lock, on the supposition we have made, a volume of water equal to that which will fill the lock between the two levels, together with the displacement of the loaded barge escapes to the lower level; and since, from the circumstances of the case, this level is maintained, there is a *loss* of water to the extent of the displacement of the barge. The *upper* level is not affected in consequence of the barge's displacement. In passing through a second lock, the same quantity of water descends; and that which is represented by the displacement just fills up the void caused by the removal of the barge, and the level is the same as if the barge had been of no definite magnitude; that is, as if a communication had been made between the locks to permit the ascent of a cork.

This same result takes place during the ascent of the barge through each successive lock until it comes to the highest.

When the barge reaches the highest level, that level (as before) is not altered on account of the barge's displacement. As, however, the barge is unloaded, it will gradually rise in the water, and the level will sink until the level is that due to the abstraction of a volume of water equal to the difference of the barge's load and light displacement.

If, then, *the level must be kept at a certain* height, this fact involves an additional expenditure of water from the reservoir to this extent. If the barge returns in this state to the lower level, the consumption of water at each lock will be a lockful *minus* the light displacement of the barge. Hence, the total additional loss of water due to the weight of the barge will be the difference of its load and light displacements. If, however, we suppose the highest level not *immediately* supplied from the reservoir, and the barge to be loaded again before its descent to the same extent as before, the expenditure of water in the locks *during both the ascent and descent*, will be exactly the same whatever be the size of the barge. And as we have seen the intermediate levels are always entirely unaffected, while the upper level can never draw upon the reservoir to a greater extent than the difference between the large load and light displacement. In forwarding these remarks, I cannot agree with "J. L." in considering this question as one of much, if any, importance in canal navigation, nor as possessing any interest but that of curiosity. Nor do I think the implied rebuke to Messrs. Baddeley and Wilkinson, for not looking more deeply into the matter, quite merited; for the question to which those gentlemen applied themselves, that, in fact, which alone was proposed, viz., the *actual quantity* of water which *passes through the lock*, under the given circumstances, they correctly solved.

The account which I have given is, I think, all that is necessary to extend their solution to the case of a loaded barge ascending through a succession of locks, from the lowest to the highest level, and descending again, both loaded and unloaded.

I am, Sir, yours, &c.,
INDAGATOR.

London, Dec. 4, 1854.

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*To the Editor of the Mechanics' Magazine.*

SIR,—Though "T. T. W." and Mr. Baddeley should look ever so deep into the lock, they can make no more of it than the correct explanation they have already given. But though "J. L." is wrong in impugning their results, he is right in asserting that the relative levels of the upper and the lower canals will not be altered in the different cases. Though 50 tons more water pass downwards in one case than in the other, the water level is not changed; and yet this is no paradox. In the ascending case the lower canal gains 50 tons more water, but it loses the boat; and though the upper canal loses 50 tons more water, it gains the boat. In the descending case the upper canal loses 50 tons *less* water, but it loses the boat; and though the lower canal gains 50 tons *less* water, it gains the boat as an equivalent. The cubical contents of

each canal continue the same both in the ascending and descending cases; therefore "J. L." is right without the other writers being wrong.

Of course a good canal man will take care not to waste the 50 tons of water by *letting it off*, but will use the full lock which has raised one boat to lower another down. The 50 tons of water is then displaced back into the upper canal, and therefore saved, in addition to the main contents of the lock doing double duty. Without this precaution, a *lock full* of water, and *no less*, will always be passed and lost in an ascent, whether the ascending bulk be a cork or a cockle-shell, or the largest and deepest boat the canal will bear; that is, if *the boat is to leave the lock* and move on.

I am, Sir, yours, &c.,
DAVID MUSHET.

December 4, 1854.

## WHEEL-CUTTING.

*To the Editor of the Mechanics' Magazine.*

SIR,—Your correspondent, "S. B.," of the 27th of November, desires a general rule whereby a wheel, with any desired number of teeth, may be cut in the machines usually at the disposal of workmen.

It is simply this:—the *difference* between the number of teeth for which the machine is set, and the number required, forms the numerator, and the number of teeth required forms the denominator of a fraction, which fraction indicates the proportion (more or less) of a complete turn of the handle of the machine required to be made for cutting the wheel. And hence it follows that the denominator of the fraction represents the number of teeth the locking-wheel must have. For example, "S. B." wants 819 teeth, the difference between which and 720=99, and taking 819 as a denominator, gives $\frac{99}{819}$; which, reduced to its smallest proportion, equals $\frac{11}{91}$. Therefore the locking-wheel must have 91 teeth, and for cutting the wheel of 819 teeth, the wheel must be locked after passing 80 of the teeth, or 11 less than a complete turn.

Testing the correctness of this by my former rule, 720 complete turns of 91 teeth=65,520 teeth passed, and $819 \times 80 = 65,520$.

For finding a wheel of 91 teeth, the best method I can give is that described by me for a "Wheel-cutter," at page 471. In this case, take a slip of paper, measuring $11\frac{3}{8}$ inches long, and divide it into 91 equal divisions of an eighth of an inch each. Turn a disc of wood down to $3\frac{5}{8}$ inches diameter, which reduce carefully until the divided slip just meets round it.

I give this method as preferable, for simplicity, to the dividing of a plate into 91 parts, which most workmen would find a troublesome thing to accomplish.

I am, Sir, yours, &c.,
EDWARD J. POWELL.

Admiralty, Dec. 4, 1854.

*To the Editor of the Mechanics' Magazine.*

SIR,—The rule for "S. B." is very simple. Take the number of teeth that the wheel requires for a denominator, and the difference between this number and the engine for a numerator; reduce the fraction to its lowest term; then divide the plate to this last denominator, and it must be turned round all its divisions, less the numerator. Thus, for an engine of 720 to cut 819 teeth,

$$819-720=99$$

$$\text{and } \frac{99}{819}=\frac{11}{91}$$

therefore the plate must be divided into 91, and moved round 80 divisions for each tooth.

I am, Sir, yours, &c.,
R. WEBSTER.

74, Cornhill.

[We have received other letters in reply to S. B., which we have not space to insert; among them, one from M. Cherbonneau, in which he gracefully acknowledges and accounts for the error of his former letter, pointed out by Mr. Powell in his rejoinder.]

*A Manual for Practical Surveyors, containing Methods Indispensably Necessary for Actual Field Operations.* By E. W. Beans. Philadelphia: J. W. Moore. London: Trübner and Co., Paternoster-row.

GOETHE has remarked that some books appear to be written for the purpose of showing that the authors know something of the subjects on which they write, rather than for the instruction of the readers.* Whichever of these may have been the object of Mr. Beans in the production of this work for practical surveyors, it is beyond all doubt that he has been signally unsuccessful. We do not for a moment hesitate to assert that the study of it can prove of service to no one, except it be in exhibiting to any individual who may contemplate the preparation of a similar work, a style and method of treatment which he must most scrupulously avoid. There are but few adults who

* *Gewisse Bucher scheinen geschrieben zu sein, nicht damit man etwas daraus lerne, sondern damit man wisse dass der Verfasser etwas gewusst hat.*

could not, (though many, we are confident, who would not), write such a manual as this.

The author may be a very competent surveyor, and, (residing in America,) may possibly have assumed a high position in his profession; but there certainly are no traces of uncommon attainments visible in his treatise, which is throughout very defective. This Mr. Beans should himself demonstrate, if we had sufficient space for the necessary quotation.

In his preface he, of course, says "The want of a work on Practical Surveying has been long felt, and is generally acknowledged." He then adds, "The numerous publications on surveying would seem to preclude the necessity of any thing new. But upon examination, we find the wants of the student have been consulted, rather than those of the practical man. Indeed, many of the publications in general use appear to have been written by those who were engaged in the instruction of youth, and who were unacquainted with the practical part of surveying, excepting perhaps so far as may have been requisite for the information of the classes under their direction.

"With a view to this defect, the following pages have been written, designed as a suitable treatise to be placed in the hands of those who wish to become familiar with the *practice* of surveying. A systematic arrangement has not been followed; but as my object is to supply the wants of the practical man (those of the students having already been supplied by the authors mentioned), this will be a matter of minor importance."

Mr. Beans, then, comes before us an instructor of really practical surveyors (a professedly unsystematical one, it is true), let us therefore notice how he deals with his pupils. His opening chapter is on the "Choice of Instruments," and as a practical hint to guide them in their selection, he recommends them "to advise with some person in whose judgment they can confide." This advice is addressed to the uninitiated; others, (who of course understand the matter without Mr. Beans' assistance) he favours with a little further detail and elaboration.

The remainder of the book is devoted to methods of conducting operations in the field. One of the favourite proceedings of the author, to which he is evidently very deeply attached, is that of *setting off certain lines at right angles to the one you are endeavouring to obtain, and of the bearing of which you are utterly ignorant.* This geometrical feat Mr. Beans is continually recommending. Again, on one occasion that gentleman requires you to "straighten a crooked boundary between two estates, so that each estate may have the same quantity of land;" and advises you to set about the operation in terms amounting to these: "Run a line from the extremity of the boundary, so as to cut off a portion from one of the estates; measure the piece cut off, and find what must be the height of the triangle which shall have for its base the line already run in, and be equal in area to the portion whose superficies has been computed, and add this triangle to the estate in lieu of the piece of ground with the crooked boundary." There is perhaps, nothing better than this in the whole book.

It is not a pleasant thing for us to have thus to complain of works on scientific subjects. It is an ungenial task forced upon us by such gentlemen as Mr. Beans. But these alone are not to blame. While such productions as the above find favour in the English press, they will certainly be compiled by one or another candidate for a little public recognition, or a little lucre. More honesty, and truth, and we may add, greater scientific acumen, are needed by reviewers in our own country. Even Mr. Beans has been flattered, and his book lauded already by a scientific, or rather pseudo-scientific journal on this side the Atlantic. We dare not augment an evil which we so much deplore.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Doulton, Henry, of High-street, Lambeth. *Improvements in kilns used in the manufacture of stoneware, earthenware, and china.* Patent dated May 11, 1854. (No. 1052.)

The object of this invention is to prevent the evolution of smoke. For this purpose, over each fire-place or furnace a fire-tile or thick plate, perforated with numerous holes, is placed, and over this a chamber is formed to receive air, there being a slide or other means of regulating the inflow of it.

Newton, Alfred Vincent, of Chancery-lane, Middlesex, mechanical draughtsman. *An improvement in the construction of carriage-wheels and in the mode of mounting them on their axles.* (A communication.) Patent dated May 11, 1854. (No. 1053.)

This improvement consists in connecting carriage-wheels in pairs by one solid axle, on which they can turn independently, "when this is combined with a non-rotating tubular axle surrounding it, which sustains the load, and which for that purpose extends into recesses in the wheels, which turn thereon, and also in combination with the two axles the interposition of a series of rollers between the fixed tubular axle and the inner periphery of the recess in each wheel."

PLATT, JOHN, of Oldham, Lancaster, machinist. *Certain improvements in apparatus or machines for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other articles in metal.* Patent dated May 12, 1854. (No. 1055.)

This invention mainly consists in dispensing with the springs used for lifting the hammer in "Ryder's Forging Machine," and in connecting the hammer with the eccentric so that it will lift it as well as force it down.

PENTON, JOSIAH, and JAMES MACKAY, of Chippenham, Wiltshire, engineers. *Certain improvements in the construction of railway-wheels and tyres.* Patent dated May 12, 1854. (No. 1056.)

The inventors form the wheel in two parts, each having an angular projection on its periphery. Upon the inside of the tyre is formed a projecting rib or feather of an angular form, which exactly fits into the groove produced by the two angular projections on the two sides of the wheel; the latter, when brought together with the tyre in its place, are fastened by bolts.

WAITE, WILLIAM, of Gloucester-street, Regent's-park, Middlesex, gentleman. *An improvement applicable to the construction of sewers, drains, and pipes, for the conveyance of sewage, water, or gas.* Patent dated May 12, 1854. (No. 1057.)

This invention consists in the formation of blocks or pieces for the construction of sewers, drains, or pipes, "from irregular fragments of stone, or from gravel, sand, or other suitable materials, conjointly or separately, caused to adhere and made into a compact mass by bituminous cement, and lined in or inlaid with zinc, glass, earthenware, or other suitable metal or material."

NIXON, CHRISTOPHER NUGENT, of Ramsgate, Kent, gentleman. *Improved modes of attaching rudders to floating vessels.* Patent dated May 12, 1854. (No. 1058.)

This invention mainly consists in attaching rudders to vessels by means of one long-rod or bar, upon which the rudder is free to slide up and down.

CAMPBELL, DANIEL, and JAMES BARLOW, of Accrington, Lancaster, machinists. *Improvements in looms for weaving.* Patent dated May 12, 1854. (No. 1059.)

The inventors employ an arrangement for securing the reed firmly in place during the beating up, whilst at the same time it leaves it perfectly free or loose if the shuttle should be lodged, or any other impediment take place in the warp or shed. This is accomplished by placing a bar or rod at the front of the slay, having a finger or projection at right angles to it at each end.

POOLE, MOSES, of Avenue-road, Regent's-park, Middlesex. *Improvements in machinery for splitting leather.* (A communication.) Patent dated May 12, 1854. (No. 1062.)

The inventor claims—1. The use of a certain endless belt-knife. 2. The endless belt-knife in combination with a method of sharpening the same, so that a knife of exceedingly cheap construction may be employed in place of the steel one heretofore used in such machines, and the same may be kept in order without interrupting the operation of the machine, or removing the knife from it.

AUBUSSON, CHARLES WILLIAM FEUILLADE, of Warren-street, Fitzroy-square, Middlesex, gentleman. *An improvement in ferrules.* Patent dated May 12, 1854. (No. 1063.)

This invention consists in giving elasticity to the lower ends of ferrules used for walking sticks, umbrellas, and other articles, by applying to such ferrules vulcanized Indian-rubber at their lower ends.

POOLE, MOSES, of the Avenue-road, Regent's-park, Middlesex. *Improvements in engraving and printing on glass, and of figuring and ornamenting the same.* (A communication.) Patent dated May 12, 1854. (No. 1064.)

This invention consists in causing a metallic cylinder, having the desired figures or letters engraved thereon, to roll in contact with the surface of the glass to be engraved, emery, either dry or mixed with water, being kept constantly at the point of contact between the two.

POOLE, MOSES, of Avenue-road, Regent's-park, Middlesex. *Improvements in fire-arms.* (A communication.) Patent dated May 12, 1854. (No. 1065.)

These improvements mainly consist in the use of a self-adjusting thimble, which is driven into the rear end of the barrel, and which is kept down upon its seat by the force of the discharge, the thimble not being absolutely secured to the barrel, but forced into its place sufficiently tight to prevent leakage between it and the barrel.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improved method of retarding the process of decay in flour, meal, grain, and other vegetable substances.* (A communication.) Patent dated May 12, 1854. (No. 1066.)

"This invention consists in removing the centre of the mass of flour, meal, &c., by placing therein an open tube or tubes (or by the employment of any substantially similar means) by which the mass is so distributed that if decay commences at any point, it must extend to a very great distance, in order to effect any considerable portion of the mass, and therefore its progress must be very slow."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in carriage-axles and their boxes.* Patent dated May 12, 1854. (No. 1067.)

*Claim.*—1. The use of a certain "double conical" journal and its box. 2. Surrounding the "double conical" axle-box with an annular oil-chamber, which has suitable openings to allow the oil to be supplied to the "double conical" journal at or near the junction of the cones.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of separating granular substances of different degrees of fineness.* (A communication.) Patent dated May 12, 1854. (No. 1071.)

In carrying out this invention, a chamber is first enclosed in a tight metallic case, and within this chamber is hung upon a shaft a square box or receptacle, slightly inclined from front to rear. (This receptacle is made square because, in revolving, it more effectually carries up and drops the material to be separated; a round one, with radial flanges, will answer equally well.) Above this chamber, and communicating with it by a passage, are receiving chambers, provided with doors. The front end of the lower chamber is separated from the main chamber by a partition. The material to be separated is introduced into the apparatus through a spout or hopper, which leads it through an air chamber into the rotating box, &c.

DRIEU, JEROME ANDRÉ, of Patricroft, Lancaster, machinist. *Certain improvements in machinery or apparatus for cutting fustians, velveteens, and other similar fabrics, to produce a piled surface.* Patent dated May 13, 1854. (No. 1073.)

*Claim.*—The arrangement and construction of machinery, in which an oscillating or undulatory motion is given to knives or cutters, working in grooved guides, whether the same be applied to a loom, or form a separate machine.

BURLEIGH, RICHARD CLARKE, of Northumberland - street, Charing - cross, Middlesex. *Certain improvements in steam engines and other engines worked by the pressure of gaseous or other fluids, which are also applicable to pumps.* Patent dated May 13, 1854. (No. 1075.)

These improvements consist in the employment in steam engines, or other engines worked by the pressure of elastic fluids, and in pumps, of a flexible metallic disc or diaphragm fixed within a rigid containing vessel as a substitute for a sliding piston, or of a collapsible metal vessel, as a substitute for the ordinary cylinder and piston.

SHAW, THOMAS GEORGE, of Old Broad-street, London, merchant. *Improvements in apparatus to facilitate the decanting of wine and other liquids.* Patent dated May 13, 1854. (No. 1076.)

This invention consists in forming a combination of apparatus for holding a bottle in an inclined position, and then steadily elevating it so as readily to decant the contents. A frame or stand is constructed, which carries a lever cradle, formed to receive a bottle, and there is an adjustable slide to accommodate the cradle or lever-frame to receive different sizes of bottles.

SCOTT, HENRY YOUNG DARRACOTT, of Queen's-terrace, Woolwich, Kent, Captain in the Royal Engineers. *An improved cement applicable as a plaster, or for moulding purposes.* Patent dated May 13, 1854. (No. 1078.)

*Claim.*—The preparation of a cement or plaster from chalk or limestone, by subjecting it, when reduced to the state of quick lime, to a dull red heat, in an atmosphere created by the combustion of carbonaceous fuels, such as coke, &c.

SAUGRIN, LOUIS FRANÇOIS, of Paris, France, photographist. *Improvements in apparatus for the production of stereoscopic and photographic pictures.* Patent dated May 15, 1854. (No. 1080.)

*Claims.* — 1. An arrangement of apparatus for obtaining several stereoscopic and photographic pictures by one operation. 2. Transferring the two frames containing the two plates, from right to left and from left to right, to obtain the necessary angle for the production of stereoscopic pictures.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in the manufacture of wheels for railway carriages.* (A communication.) Patent dated May 15, 1854. (No. 1081.)

*Claims.* — 1. The method of making the central portion of a railway carriage wheel by forming corrugations upon a plate of metal, so as to be deepest at one edge and taper off gradually to nothing, or nearly so, at the other, whereby the first-named edge, and all lines parallel thereto, will be gathered towards a central point, in proportion to the number and depth of the corrugations, and the opposite edge will become a circle and the corrugations become radii, a disc being thus formed. 2. Combining a wrought-iron tyre with the plate of metal, out of which the centre of a wheel is to be formed, either by a dovetail or by rolling it out of the solid, and subsequently bending the said tyre into a circular form at the same time that the plate of metal is receiving its corrugations.

CHEDGEY, JOHN, of the Grove, Southwark, Surrey, engineer. *An improved manufacture of rollers and cylinders applicable to*

*various kinds of machinery where a smooth, hard, and regular surface is required.* Patent dated May 15, 1854. (No. 1084.)

This invention mainly consists in the application of glass rollers and cylinders, manufactured in a certain described manner, to various kinds of machinery where a smooth, hard, and regular cylindrical surface is required.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for cutting or shaping wood or other materials.* (A communication.) Patent dated May 15, 1854. (No. 1085.)

This invention consists in so constructing the cylinder or cylinders to which the cutters are applied, that there shall be an open space or spaces through the cylinders, for the purpose of allowing slivers or large shavings or chips to pass through, the lighter being thrown off tangentially by the velocity of the cylinder.

MILLER, THOMAS WILLIAM, of Queen's-place, Southsea, Hants. *Improvements in railway-sleepers.* Patent dated May 16, 1854. (No. 1087.)

This invention has for its object an improved construction of wrought-iron sleepers for railways, and consists in employing plate and angle iron, in combining the same in certain described ways, and in uniting the parts by rivets or otherwise.

DERING, GEORGE EDWARD, of Lockleys, Herts. *Improvements in obtaining motive power by electricity.* Patent dated May 16, 1854. (No. 1088.)

The inventor employs a cylinder which, by the action of electro-magnets, is caused to roll or rock on another surface. This surface is composed of a series of electro-magnets, and the rocking surface is either made itself to constitute a keeper or armature for all the magnets, or it carries or has suspended to it a number of keepers or armatures corresponding with the electro-magnets.

DURANT, ANGUISH HONOUR AUGUSTUS, esquire, of Tong Castle, Salop. *Improvements in apparatus for sweeping chimneys and flues, and for extinguishing fires therein.* Patent dated May 16, 1854. (No. 1089.)

The inventor uses an open framework of metal, wood, or gutta percha plates, which have holes or slides for rods to pass through. At the outer ends of the rods are attached brushes, forming externally a square head, and expanded by springs, either fixed to the stem or to the brushes. The plates, brushes, and levers are fitted with friction wheels.

MILLER, THOMAS WILLIAM, of Queen's-place, Southsea, Hants. *Improvements in railway-sleepers.* Patent dated May 16, 1854. (No. 1090.)

This invention also consists in employing angle iron of certain forms as railway-sleepers.

MANWARING, GEORGE, of Southampton, Hants, engineer, and WILLIAM ALLTOFT SUMMERS, also of Southampton, engineer. *Improvements in supplying water for water-closets, for the flushing of drains, and for general purposes.* Patent dated May 16, 1854. (No. 1091.)

*Claim.*—Supplying water for the purposes above mentioned through a closed reservoir or receiver fitted with an air-valve or valves, and in combination with a two-way supply cock or valve, so constructed and operating that during the time the reservoir is being filled no water can be drawn therefrom, and when the water is being drawn from the reservoir, the communication between it and the cistern is closed.

BAKER, JAMES PHILIP, of Chillington Colliery, Wolverhampton, Stafford, mining engineer. *Improvements in the construction of railway and other bridges, and in the method of lifting the same after sinking.* Patent dated May 16, 1854. (No. 1092.)

*Claims.*—1. The construction of railway and other bridges in such manner as to admit of easy access being obtained thereto, for the purpose of lifting such bridges after sinking. 2. The construction of such bridges with the platform, girders, and parts in connection therewith, independent of the fixed masonry. 3. The construction of such bridges with the platform and girders overhanging or extending beyond the abutment walls or piers and trestles, and with walls to support such overhanging parts, and prevent the ballast or other rubbish falling in between the girders. 4. The construction of the abutment walls or piers of railway or other bridges with plates built thereon for the purpose of receiving and supporting the platforms.

CORNFORTH, HENRY, of Birmingham, Warwick, manufacturer. *An improvement or improvements in shaping and ornamenting metals.* Patent dated May 17, 1854. (No. 1096.)

These improvements consist in shaping and ornamenting metals by forcing metallic plates into moulds or dies by the pressure of water or steam.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of tenon, and of machinery for forming the same; applicable to the manufacture of boxes and other analogous uses.* Patent dated May 17, 1854. (No. 1098.)

The patentee claims the employment in the manufacture of boxes and other articles of joinery to which the same is applicable of a certain "double oblique tenon," and

the use of suitably shaped conical rotating cutters or their equivalent for forming this tenon.

CATLOW, CHRISTOPHER, of Clitheroe, Lancaster, overlooker, and THOMAS COMSTIVE, of Burnley, shuttle-maker. *Improvements in shuttles for weaving.* Patent dated May 17, 1854. (No. 1099.)

These improvements consist in causing the shuttle peg to contract and expand by turning it upward and downward, the expansion not being positive in amount, but capable of being modified by the resistance of the cop.

WORTHINGTON, JONATHAN, of Llancaiach and Gilvach Main Collieries, near Cardiff, Wales, gentleman, and FENNELL ALLMAN, of Adam-street, Adelphi, London, consulting engineer. *Certain improvements in boring, mining, and blasting, and in the apparatus connected therewith.* Patent dated May 18, 1854. (No. 1103.)

This invention mainly consists in the employment of drills which receive a rotary or reciprocating motion,—in using steam, wind, or water power to drive such drills,—and in employing cylindrical saws, or plain edged cutting cylinders, for cutting coal in mining operations.

## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ABBOTT, EDWARD WILLIAM, of Regent's-quadrant, Middlesex, laceman. *Certain improvements applicable to the manufacture of umbrellas and parasols, and cases for containing the same.* Application dated May 11, 1854. (No. 1054.)

Instead of making the stem or stick of the umbrella of a round tube, the inventor constructs it of rolled metal, having its cross section of the form of a cross. The angular recesses thus obtained are made to receive the ribs and stretchers of the umbrella, two of which lie in each recess.

HOLT, THOMAS LITTLETON, of Warwick-square, Paternoster-row, London, and WILLIAM CHARLTON FORSTER, of Hatton-garden, Middlesex. *Making paper.* Application dated May 12, 1854. (No. 1060.)

The inventors take the refuse tan of tanners and dry it, and mix it with the refuse cocoa-nut fibre and old rope or rags in equal parts, and make the whole into pulp in a beating-engine, as in the ordinary paper-making process.

CROWLEY, HENRY, of Manchester, iron-founder. *Improvements in machinery for grinding bones.* (A communication.) Application dated May 12, 1854. (No. 1061.)

These improvements consist in various combinations of circular saws, between which the bones to be operated upon are made to pass. These saws are fixed upon shafts, and are held apart by plates of suitable thickness. The surfaces of each combination of saws are made to revolve at various velocities and in various directions when they act on the bones. Other rollers, with rough or toothed surfaces, may be added for keeping the bones in motion in the hopper.

WESTLY, WILLIAM KING, of Leeds, York, machinist. *An improved construction of railway, and carriages to be employed thereon, applicable chiefly to farm purposes.* Application dated May 12, 1854. (No. 1068.)

In carrying out this invention pillars are made to project through, and serve to carry a line of wood planking to the sides of which iron rails are affixed. Upon these rails, which form a double way, run the wheels of the carriages, and for a further support to the carriages, and to keep them perpendicular, the pillars carry at their upper ends a similar arrangement of rails, against which guide wheels, placed on the top of the carriage, run.

HEMMING, FREDERICK SHAND, of Woodside, Birkenhead, Chester, civil engineer. *Improvements in the manufacture of iron houses, part of which improvements is applicable also to the construction of sheds and fences.* Application dated May 12, 1854. (No. 1069.)

These improvements relate, firstly, to an improved mode of securing the corrugated iron sheets of houses, &c., to the vertical columns or framing of such structures, the object being to prevent the necessity of making bolt holes through the sheets. The columns are cast with rebates on opposite sides, and the galvanized iron sheets are placed (with their corrugations lying horizontally) against the shoulders which project laterally from the columns. The contact edges of these shoulders are shaped to fit the ends of the sheets, and fillets of iron or wood, having indentations on one edge to fit the corrugated sheets, are brought into close contact with the ends of the sheets, and these fillets being bolted to the columns, the sheets are held firmly in place.

SMITH, FREDERICK, of York-street, Lambeth, Surrey, oven-builder. *An improved arrangement of furnace for consuming smoke.* Application dated May 12, 1854. (No. 1070.)

The inventor casts the fire-bars hollow, leaving their forward ends open to the atmosphere, and connects their inner ends with a cast-iron box or hot-air chamber, which is so placed as to form the bridge of the furnace.

BARSANTI, EUGENE, Professor of Physics and Mathematics in the Institute Ximeniano, and FELIX MATTEUCCI, gentleman, of Florence, Tuscany. *A new or improved mode*

*of applying the explosion of gases as a motive power.* Application dated May 13, 1854. (No. 1072.)

Each of the cylinders used by the inventors in constructing their engines has at its lower end two openings, which are connected by an outer passage; the one, opening when the piston is at its lowest position, communicates with the interior of the cylinder above the piston; and the other communicates with the cylinder below the piston, and above the piston the cylinder is open to the atmosphere.

GARFORTH, CHARLES, of Dukinfield, Chester, engineer. *Certain improvements in apparatus to be employed in the construction of the permanent way of railways.* Application dated May 13, 1854. (No. 1074.)

"The method of effecting my invention," says Mr. Garforth, "is by bringing the two inclined planes of a double wedge into juxtaposition, and by means of a headed screw or bolt passing through both wedges (the head of the screw or bolt resting on the base of one wedge, and one of two nuts acting on the base of the other wedge), to cause the inclined planes to slip or pass over each other, thereby enlarging the expanse of the double wedge, and permanently tightening up or securing the rail in the chair.

RUSSELL, HENRY HEATHCOTE, of York-buildings, Adelphi, civil engineer. *An improved and ready mode of coupling, connecting, or joining.* Application dated May 13, 1854. (No. 1077.)

In a plate of iron, or other material, the inventor forms an aperture or slot, resembling a key-hole; and the inner sides of the plate about the aperture are so cut as to make two inclined planes in opposite directions. The end of the material to be connected is made with a shoulder resting against the perforated plate, and a projection, which passes through the aperture, and is turned a quarter round, so as to take into and hold by the inclined sides of the aperture.

MARIE, JOSEPH VALENTINE HENRY DE STE., manufacturer, of Paris, France. *Certain improvements in the means and apparatus for fixing capsules on bottles, vessels, or flagons.* Application dated May 15, 1854. (No. 1079.)

The inventor constructs an apparatus, which, when a bottle is placed in connection with it, cords the capsule upon the bottle, &c.

SCOTT, RICHARD, of Basford, Nottingham, framesmith, and THOMAS ROWLAND, also of Basford, Nottingham, setter-up and framesmith. *Improvements in machinery employed in the manufacture of knitted fabrics.* Application dated May 15, 1854. (No. 1082.)

The inventors use fixed frame or machine needles or sinkers, moving in the usual way, having plates cast in the same leads. The slur-cock, jacks, and presser-bar are dispensed with, and the loop is partly formed by lifters, worked by a revolving cylinder, having one or more curved plates screwed diagonally on its circumference. The thread is laid across the needles by a travelling guide in the usual way, and the whole forms a complete machine.

PRINCE, PAUL, of Derby, railway-inspector. *Retarding railway trains on the approach of danger, and for other purposes.* Application dated May 15, 1854. (No. 1083.)

The inventor proposes to work breaks attached to the wheels of all the carriages by means of wedges which fall down between the connecting bars of each pair of breaks, the necessary power being transmitted from one carriage to another by means of longitudinal shafts and radial arms.

SMITH, WILLIAM, and WILLIAM BRAMWELL HAYES, both of Manchester, Lancaster, manufacturers. *Certain improvements in power-looms for weaving.* Application dated May 17, 1854. (No. 1093.)

These improvements consist in the application or use of an endless chain or succession of shuttle-boxes, so that upon each shuttle passing through the slay another is presented to follow the course or transverse design of the work.

HARRIS, RICE, and RICE WILLIAMS HARRIS, of Birmingham, Warwick, glass manufacturers. *Improvements in the manufacture of articles in glass.* Patent dated May 17, 1854. (No. 1094.)

These improvements consist in the use of an expanding core, mounted on an horizontal plate. The article to be treated is first hollowed, and then placed upon this core, which being formed in sections and made to expand by suitable machinery, stretches the glass to the required size and shape.

CHEADLE, GEORGE, of Wolverhampton, Stafford, manufacturer. *A new or improved lubricating composition.* Application dated May 17, 1854. (No. 1095.)

This invention consists in forming a mixture of palm oil, tallow, carbonate of soda, carbonate of potash, and bone gelatine. The gelatine is dissolved in lime-water, or a mixture of lime-water and chalk; the potash and soda are dissolved therein; the palm oil and tallow are added to the solution, and heat is then applied until the whole are thoroughly incorporated. If necessary, the mixture may be thinned with lime-water.

RABIER, JEAN MARIE, architect, of Paris, France. *Certain improvements in keels of ships and vessels.* Application dated May 17, 1854. (No. 1097.)

This invention consists in building ships and vessels with a flat bottom, along which runs a keel, which is hinged longitudinally to the bottom. By means of some suitable apparatus placed inside the vessel, this moveable keel is placed either perpendicular to the flat surface of the ship's bottom, or it is turned down upon the same, and laid flat upon it, or parallel to it.

DIGGLE, SQUIRE, of Radcliffe, Lancaster, machine maker. *Improvements in looms for weaving*. Application dated May 17, 1854. (No. 1100.)

This invention relates primarily to a method of varying at pleasure the amount of work taken up in looms when two or more shuttles are employed, and consists in causing the revolution of the work-beam to take place, through the intervention of apparatus, which the rising-box brings into a suitable position for operating.

WETHERELL, LIONEL JOHN, of Percival-street, Clerkenwell, Middlesex, civil engineer, and AUGUSTUS JOHANN HOFFSTAEDT, of Albion-place, Surrey, agent. *An improved construction of pump*. Application dated May 17, 1854. (No. 1101.)

The object of this invention is to render pumps less liable to choke than heretofore, by the entrance of extraneous matters with the water that is required to be raised. To attain this end, the inventors substitute spherical valves for the hinge-valves, or those which slide up and down in guides.

## PROVISIONAL PROTECTIONS.

*Dated August* 23, 1854.

1852. James Hadden Young, of Great College-street, Camden-town. Improvements in the construction of railways.

*Dated September* 14, 1854.

1997. Charles Frederick Stansbury, of Cornhill, London. Machinery for making lock springs. A communication.

*Dated October* 10, 1854.

2166. Samuel Hancock, of Woolaton street, Nottingham, silk-agent. Improvements in the manufacture of looped fabrics.

*Dated November* 3, 1854.

2330. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex. Certain improvements in railway-carriage axle-bearings.

*Dated November* 7, 1854.

2350. Louis Napoleon Langlois, of Paris, merchant. Improvements in the construction of steam-boats.

*Dated November* 13, 1854.

2400. The Honourable William Edward Fitzmaurice, of Hamilton-lodge, Kensington-gore, Middlesex. Improvements in bullets, shells, and other projectiles.

2401. Antoine Edouard Brisbart Gobert, of Montmirail (Marne), France. A new kind of stamping-press.

2402. Joseph Armstrong, of the Normanton Station, Wakefield, York. Certain improvements in chairs and crossings for the permanent way of railways.

2403. Ismaël Isaac Abadie, of Paris, France, gentleman. Certain improvements in the mode of working screw propellers.

2404. David Caddick, of the Ebbw Vale Iron-works, Monmouth, mason. Improvements in puddling-furnaces.

*Dated November* 14, 1854.

2405. John Hewling Luson, of Old Kent-road, Surrey, engineer. Improvements in breaks for railways and other like purposes.

2406. Adolphe Pécoul, master mariner, of Marseilles, France. A new or improved system of marine log, to be called "Sounding Log."

2407. James Howarth, of Poplar, Middlesex, steward. An improvement in boots, shoes, and other coverings for the feet.

2408. Lancelot Kirkup, of Orchard-street, Newcastle-on-Tyne, mechanical engineer. Improvements in anvils.

2409. Alexander Turnbull, of Manchester-square, Middlesex, doctor of medicine, at present in Boston, Massachusetts, United States of America. An improved saw.

2410. Henry Law, civil engineer, of Essex-street, Strand, Middlesex. Improvements in guns, and in the projectiles to be fired therefrom.

2411. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex. Improvements in projectiles.

2412. Samuel Pearson, of Woolwich, Kent, engine-smith. An improvement in the manufacture of gun-barrels, pipes, and tubes.

2413. Pierre Joseph Meeus, of Paris, France, engineer. A new or improved wind instrument. A communication.

*Dated November* 15, 1854.

2415. Jean Marie Chevron, of Paris, France, civil engineer, and Charles Victor Frederic de Roulet, of the same place, late a ship-owner, but now out of business. Improvements in machinery for manufacturing textile fabrics.

2416. David Davies, of Wigmore-street, Cavendish-square, Middlesex, coach-maker. An improvement in roller blinds.

2417. Arthur Warner, of New Broad-street, London, merchant Improvements in combining sheets of copper or its alloys with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury.

2418. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in the manufacture of thread from gutta percha and similar gums, in gilding, silvering, and ornamenting the same, before or after being manufactured into fabrics, and in machinery and apparatus employed therein. A communication.

2419. William Hunter Meriwether, of Coma, Texas, United States of America. An improvement in the manufacture of wrought-iron posts or uprights for fences and hurdles.

2420. Frederick Joseph Bramwell, of New Bridge-street, Blackfriars. Improvements in steam engines and steam hammers.

2421. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of manufacturing soluble silicates. A communication.

2422. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in air-pistols. A communication from Daimé Lemaire.

2423. James Buchanan, of Glasgow, Lanark,

gentleman. Improvements in the manufacture of heddles or healds for weaving.

*Dated November* 16, 1854.

2424. George Henry Ingall, of Throgmorton-street, London, gentleman. An improved method of communication between passengers and guards, &c., for the prevention of loss of life and accidents on railways.

2425. Peter Knowles, of Bolton-le-Moors, Lancaster, foreman, and Edward Kirby, of the same place, traveller. Improvements in machinery for opening, cleaning, and preparing cotton, and other fibrous materials.

2426. Robert Wilson, of Birmingham, Warwick, manufacturer. A new or improved ornamental material or fabric.

2427. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in silk-winding machinery. A communication.

2428. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in obtaining alcohol, alcoholic, and acetous products. A communication.

2429. Samuel Henton, saddler, Lambeth, Surrey. An improved saddle.

2430. William Charles Day, military equipage-manufacturer, of the Strand, Middlesex. An improved construction of portable camp-bed.

2431. John Platt, of Oldham, Lancaster, mechanical engineer. Improvements in machinery or apparatus for making bricks.

2432. William Hann, of Hetton Fence Houses, Durham. Improvements in propelling vessels.

2433. William Low, of Lloft Wen, near Wrexham, Denbigh. Improvements in ventilating mines.

*Dated November* 17, 1854.

2435. Joseph Wilson, of Hopton, York, manufacturer. Improvements in the manufacture of printed warp fabrics.

2436. John Bellamy, of Upper-street, Islington. Improvements in graining and imitating marble, fancy, and other woods.

2437. James Higgins, of Salford, Lancaster, machine-maker, and Thomas Schofield Whitworth, of the same place, manager. Improvements in apparatus for moulding, for casting shot, shells, and other articles.

2438. Leon Castelain, of St. James's-place, Hampstead-road, Middlesex, chemist. A new manufacture of pulp for making paper and millboard.

2439. Thomas Kennedy, of Kilmarnock, Ayr, gun-manufacturer. Improvements in shot or projectiles.

2440. John Macadam, of Glasgow, Lanark, doctor of medicine. Improvements in the preparation or sizeing of paper, or the materials used in the manufacture thereof.

2441. Charles Asprey, of New Bond-street, Middlesex, dressing-case, dispatch-box, and writing-case manufacturer. Improvements in handles, particularly applicable to dressing-cases, dispatch-boxes, writing-cases, and other similar articles.

2442. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton. Improvements in preventing incrustation in steam boilers. A communication.

*Dated November* 18, 1854.

2445. Richard Gaunt, of Birmingham, Warwick, stamper and piercer. A new or improved dress-fastening.

2446. Henry Robert Ramsbotham, of Bradford, York, worsted-spinner, and William Brown, of the same place, mechanic. Improvements in combing wool, cotton, tow, certain descriptions of hair, and other fibrous substances.

2447. Henry James Luff, of Thanet-place, Temple-bar, Middlesex, engraver. Improvements in the mode of attacking hostile bodies, also applicable to the obtainment of plans of forts, &c.

2448. Théodule François Calard, machinist, of Paris, France. Certain improvements in bedsteads.

2449. Edouard Belmer, of Macclesfield-street, City-road, Middlesex, engineer. A new manufacture of apparatus for warming rooms and workshops.

*Dated November* 20, 1854.

2453. Pierre Alexandre Dulaurens and Marie Anatole Laubry, of Paris, France. Certain improvements in glove fixings or fastenings.

*Dated November* 21, 1854.

2457. Richard Knight, of Charterhouse-square. Improvements in apparatus for testing iron as to its capacity for receiving magnetism, and in magnetic apparatus.

2459. William Beasley, of Smethwick, Stafford, manufacturer. Improvements in the manufacture of gun-barrels.

2461. Edmund Hunt, of Glasgow, Lanark, gentleman. Improvements in screw propellers, and in ships or vessels.

*Dated November* 22, 1854.

2463. Jean Baptiste Bagary, stockholder, of Paris, France. Improvements in sawing-apparatus.

2465. John Henry Johnson, of 47, Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of piled goods, and in the machinery or apparatus employed therein. A communication.

2467. Robert Gibson, of Hunslet, Leeds, York, engineer. Certain improvements in machinery for carding wool, flax, cotton, and other fibrous materials. A communication.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 5th,* 1854.)

1639. William Church and Samuel Aspinwall Goddard. An improvement or improvements in ordnance.

1643. Louis Christian Koeffler. Improvements in finishing or polishing yarns or threads.

1658. Barton H. Jenks. Improving the art of weaving, being an improvement in looms for weaving fancy fabrics.

1664. Robert Henry Thompson. A universal self acting sawing machine.

1676. John Youil Borland. Improvements in machinery for preparing and spinning fibrous materials.

1684. Henry Adams. A revolving ventilator.

1692. Christopher Ridout Read. Improvements in slide valves of steam-engines. A communication.

1698. James Griffiths. A new or improved lever bit for horses.

1771. William Todd. Certain improvements in power looms for weaving.

1772. William Crosland. Certain improvements in machinery or apparatus for governing or regulating the speed of steam-engines or other motive power engines.

1835. William Henry Smith, Henry Bessemer, and Robert Longsdon. Improvements in the manufacture and treatment of slag and vitreous substances, and the combination of other substances therewith.

1852. James Hadden Young. Improvements in the construction of railways.

2045. Henry Holland. Improvements in the manufacture of umbrellas and parasols.

2166. Samuel Hancock. Improvements in the manufacture of looped fabrics.

2183. Ancel Alexander Routledge. Improve-

ments in the manufacture of detonating railway signals.

2256. John Maddox, Edward Gardner, and George Dyer Green. Improvements in weaving fringes.

2302. Oliver Magge. Improvements in portable steam engines.

2330. Perceval Moses Parsons. Certain improvements in railway carriage axle bearings.

2350. Louis Napoleon Langlois. Improvements in the construction of steam boats.

2356. Edward Simons. A new or improved candlestick.

2362. Leone Glukman. Improvements in effecting electric communications in railway trains.

2387. Edward Loysel. Improvements in obtaining infusions or extracts from various substances.

2401. Antoine Edouard Brisbart Gobert. A new kind of stamping press.

2406. Adolphe Pécoul. A new or improved system of marine log, to be called "Sounding Log."

2411. Perceval Moses Parsons. Improvements in projectiles.

2416. David Davies. An improvement in roller blinds.

2417. Arthur Warner. Improvements in combining sheets of copper, or its alloys, with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese or mercury.

2419. William Hunter Meriwether. An improvement in the manufacture of wrought iron posts or uprights for fences or hurdles.

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2421. Alfred Vincent Newton. An improved mode of manufacturing soluble silicates. A communication.

2423. James Buchanan. Improvements in the manufacture of heddles or healds for weaving.

2432. William Hann. Improvements in propelling vessels.

2435. Joseph Wilson. Improvements in the manufacture of printed-warp-fabrics.

2440. John Macadam. Improvements in the preparation or sizeing of paper, or the materials used in the manufacture thereof.

2446. Henry Robert Ramsbotham and William Brown. Improvements in combing wool, cotton, tow, certain descriptions of hair, and other fibrous substances.

2461. Edmund Hunt. Improvements in screw propellers, and in ships or vessels.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## PRIVY COUNCIL APPOINTMENTS.

The Judicial Committee of the Privy Council have appointed Wednesday, 10th January, 1855, at half-past 10 A.M., for the hearing of the following matters.—The petition of Edward Foard, of Nicholas street, Hoxton, Middlesex, machinist, praying for a prolongation of the several letters patent granted to him for England January 16, 1841, for Scotland 16th July, 1841, and for Ireland 28th August, 1841, for "an improved method or improved methods of applying fuel to the fire-places or grates of steam engines, boilers, brewers' coppers, and other furnaces, as well also to the fire-places employed in domestic purposes, and generally to the supplying of fuel to furnaces or fire-places in such a manner as to consume the smoke generally produced in such furnaces or fire-places."

The petition of William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., praying for a prolongation of the letters patent granted to him 8th February, 1841, for "improvements in obtaining pictures or representations of objects."

And the petition of Mary Honiball, of St. John's Wood, widow, praying for a confirmation of the letters patent granted to her 9th February, 1853, for "improvements in anchors," for which improvements a patent was granted to William Henry Porter, of Russia-row, Milk-street, Cheapside, London, warehouseman, 15th August, 1838.

## NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council by Thomas Clark, professor of chemistry, in Marischal College, University of Aberdeen, praying Her Majesty to grant a prolongation of the letters patent granted to him 8th March, 1841, for "a new mode of rendering certain waters (the water of the Thames being among the number) less impure and less hard for the supply and use of manufactories, villages, towns, and cities."

On the 9th January, 1855, an application will be made to the Committee to fix an early day for the hearing of the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council-office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed December 1, 1854.*

1321. Joseph Fourdrinier.
1373. Ephraim Smith.

*Sealed December 5, 1854.*

1250. Lemuel Brockelbank.
1258. John Mansfield.
1263. Joseph Kaye.
1266. James Leadbetter, William Wight, and Thomas Davis.
1271. Jean Baptiste Numa Erard.
1275. John Nelson and David Boyd.
1279. Julian Bernard.
1281. John Braithwaite.
1322. Alfred Vincent Newton.
1344. Joseph Day.
1379. Isaac Farrell.
1426. John Gregory Jones.
1498. James Lee Norton.
1954. Robert Adams.
2000. Robert Adams.
2084. Alfred Vincent Newton.
2102. Arthur Boyle.
2122. William Edward Newton.
2164. Henry Thomas White and George Roberts.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

The letters of "Engineer," "J. F. D.," and several other correspondents, have been received; some of them will be inserted as soon as is convenient.

*T. L. L.*—We do not think it advisable to publish detailed descriptions of the gun-boats and floating batteries now in course of construction for Her Majesty's Government, since the *Mechanics' Magazine* is still circulated in Russia, notwithstanding the existing hostilities. It is quite true that Russian men of science and the Imperial Government *may* have at their disposal means of acquiring what information they desire concerning the works in progress here; but this fact can by no means induce us to present it freely to them.



## CONTENTS OF THIS NUMBER.



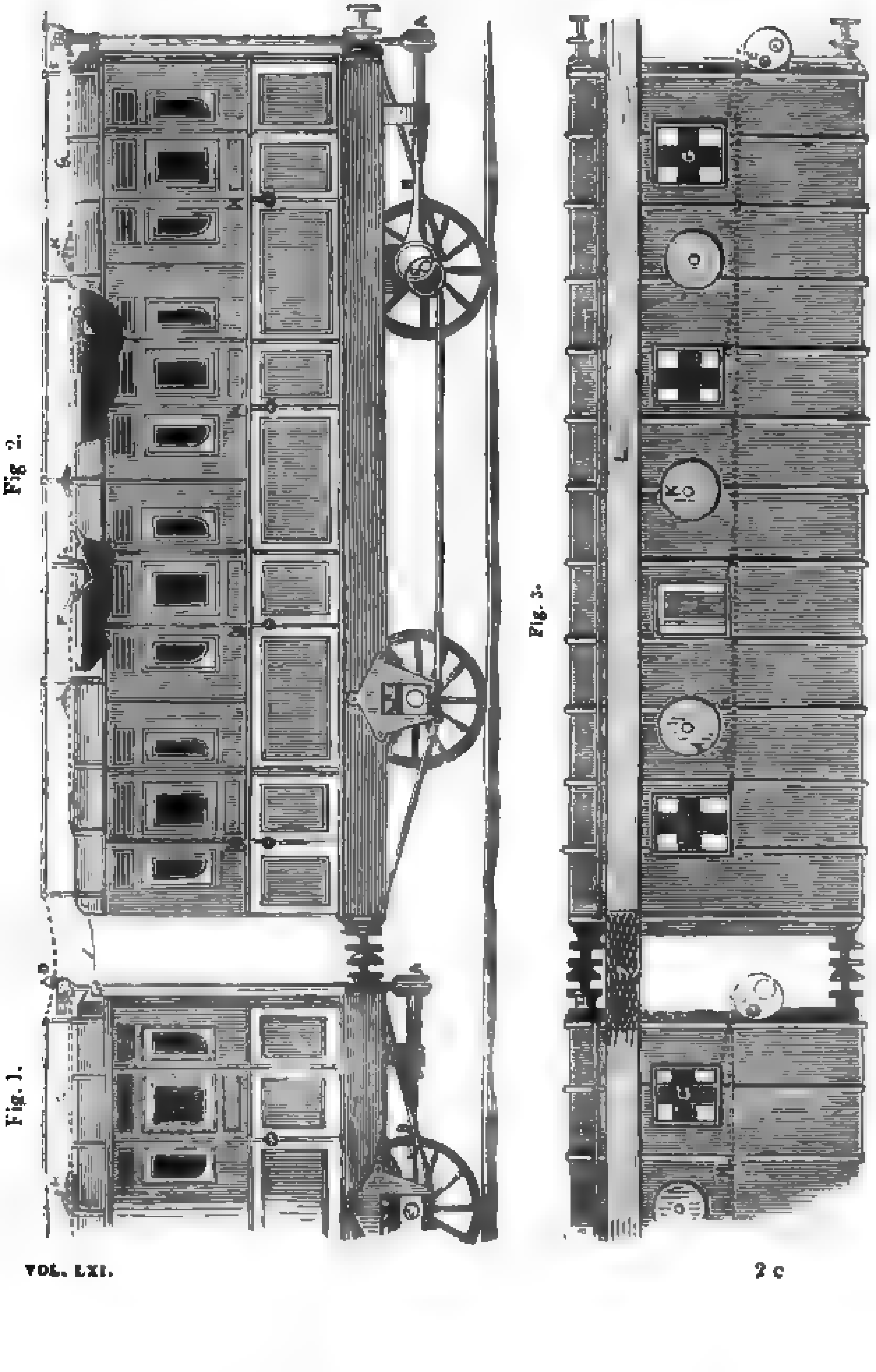
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1636.] SATURDAY, DECEMBER 16, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet street.


## INGALL'S PATENT RAILWAY-SIGNALS.



## INGALL'S PATENT RAILWAY-SIGNALS.

Mr. Ingall has recently patented an improved method of communication between the guard and engine-driver, the passengers and guard, and *vice versâ*, an engraving in illustration of which we publish on the preceding page. Figs. 1 and 2 represent side views, and fig. 3 a plan of a pair of railway carriages, with the improvements attached. Placed at the end of every carriage of the train, is a force-pump, A, the piston, B, of which, being placed eccentric with the axle of the wheel, C, supplies a constant rush of air to the whistle, D, which air, when not required for signalling, is allowed to escape through the aperture, E. F is the handle of a metallic plate, containing a glass reflector, and G is the signal, the shaded parts of which are formed of red glass. H is a chain attached to the signals and the lever, I, which is connected to a valve used for opening or shutting off the supply of air from the whistle, D. K is the carriage-lamp; L a board passing along the top of the carriage, and *l* a piece of cocoa-matting connected by hooks and eyes from one carriage to another, completing a continuous path along the train. M is railing fixed to the top of the carriage for the guard to hold by.

In the event of any danger occurring in a carriage, a passenger pulls down the handle, F, fig. 2, which handle at the same moment raises the danger-signal, G, at the same time shutting the open valve, and allowing the air to rush into the whistle. The guard, on hearing the whistle, looks along the line of carriages, and at once detects by the signal where he is wanted; he then makes his way, holding on by the railing, M, until he reaches the compartment of the carriage where the signal is raised, and where his services are required; on reaching the place he is then enabled, by means of the aperture made by the open reflector and signal, to learn the cause for which he is wanted. The engine-driver also hears the whistle, and is watching for the guard's signal either to stop, slacken, or continue his former speed. The signal (when once the handle is drawn down) goes up with a spring, and cannot be put down again by any one but the guard, and then only from the outside of the carriage. The guard has also attached to his box a whistle similar to those on the other carriages, but larger, so that on the driver hearing that, brings the train to a standstill.

Fig. 1 represents the signals down, and travelling in safety. On the signal being used at night, the guard is enabled to tell where he is wanted by the following means:—On the reflector, F, being drawn down to the angle shown, fig. 2, the light from the carriage lamp, K, reflecting upon the danger signal, G, enables the guard at one end of the train to see it, and through the red glass of the signal at the other.

## NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S., and Corresponding Member of the Manchester Literary and Philosophical Society.)

NO. V.

(*Continued from page 246.*)

The Theory of Poles and Polars is well known to have had its principal origin in La Hire's *Sectiones Conicæ*, 1685; but its properties were never treated as a regular system until the continental geometers took up the subject towards the close of the last century. One or two of the leading properties, so far as regards the circle, may indeed be found in Muller's *Mathematics*, 1748, and several others lie scattered in the pages of some of our mathematical periodicals; but the majority of those who contributed to such works too often expended their energies upon isolated problems; and hence we owe to the school of Monge some of those beautiful theories which were long before within the reach of English mathematicians. In 1760, Mr. Lionel Charlton, of Whitby, calls in the assistance of several properties which have since formed the basis of the theory of Radical Axes, when solving an isolated problem in the *Ladies' Diary*; but I do not find that the value of these properties was then understood by any of his contemporaries, and the subject was allowed to remain unextended until Dr. Henry Clarke, of Manchester, endeavoured in some measure to systematise and apply the properties in his *Rationale of Circulating Numbers*, published in London in 1777. Mr. Charlton's demonstration, and its accompanying diagram, show clearly that "*the radical axes of three intersecting circles meet in a point;*" and that "*tangents drawn from the radical centre to the three circles are all equal to each other;*" but these properties are not *formally* stated, and are only used as subsidiary to another problem. In Dr. Clarke's volume the former property is adapted to

the case of contact of two of the three circles, and he observes that "the converse of this is also true." Both properties are then formally stated in Proposition V., p. 202, and are subsequently applied:

1. To find the centre of a circle on a line AC given in position, which shall pass through a given point on that line, and touch a circle given in magnitude and position.

2. The same things being supposed as in the last, it is required to find the centre of the circle when the given point A is not in the line AC.

3. To find the centre of a circle to pass through two given points, and cut off from a given circle a given arc.

[This is Mr. Charlton's problem.]

4. To find the centre of a circle on a line given in position with respect to a given circle, which may cut off from the given circle an assigned arc.

[Dr. Clarke remarks that "this proposition is *unlimited*, but is inserted on account of its use in geometrical constructions."]

5. The same things being supposed as in the last proposition, it is required to find the position of the centre P when the circle is restricted to a given magnitude.

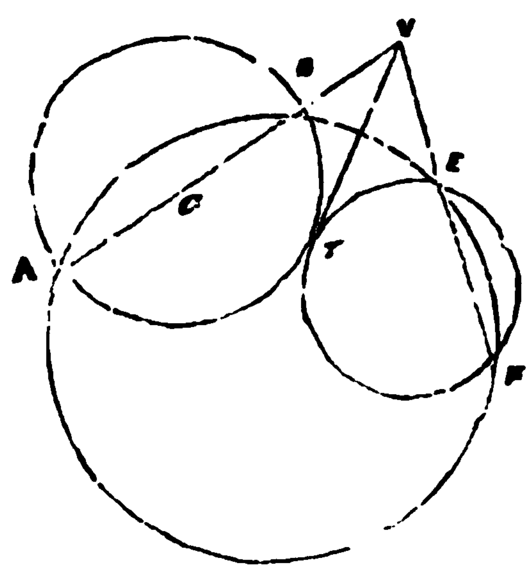
In a former proposition, Dr. Clarke considers the drawing of a line AF, divided in G, such "that either the sum, difference, ratio, rectangle, sum of the squares, or difference of the squares of AG and GF, may be of a given magnitude;" and at the close of his paper remarks, that "a great variety of geometrical problems may be constructed" from what has been laid down. The propositions themselves appear to have been "drawn up in 1775, before the commencement of *Burrow's Diary;* and before [he] had seen the Rev. Mr. Lawson's *Dissertation on the Geometrical Analysis of the Antients.*" Both Mr. Lawson and himself had "fallen upon the same method of constructing the third case.... being in effect the same" as Prop. 155, Book VII. of *Pappi Math. Coll. Venetiis*, 1589. This he thinks proper "to mention in order that [he] may prevent, if possible, that too just charge against most modern writers—*plagiarism.*" At the time when these meritorious essays were published, such a precaution was not unnecessary. The properties relating to Radical Axes had been partially developed by Mr. Charlton, and also by a writer in the *Monthly Review*, while those relating to *Halley's Diagram* had recently been discussed to some extent by Mr. Burrow in the first number of his *Lady's and Gentleman's Diary.* Dr. Clarke, however, appears to have had a clearer conception of their utility than most of his contemporaries, and his papers have the additional merit of being the earliest, and almost the only attempts of the Lancashire geometers to systematise their inquiries. The publication of Mr. Lawson's *Dissertation* marks an epoch in the revival of the study of the ancient geometry, and the solution of all the theorems and problems at the end of that essay long formed an object of ambition to many ardent geometers. To "divide the area of a circle geometrically into a given number of parts, which may be equal both in area and circumference," was a problem in that collection; and the honour of publishing the first solution is specially claimed for himself by Dr. Hutton in his *Mathematical Tracts.* On the question being transferred to the *Rationale*, Dr. Clarke takes the occasion to announce that "the demonstrations of all the theorems, with the geometrical constructions of all the problems contained in this [Mr. Lawson's] book, will be given at the latter end of *An Essay on the Usefulness of Mathematical Learning*, which will soon be published;" but I have not been able to ascertain that his intentions were ever fulfilled. Had the work been issued, its utility would have been undoubted, for it was intended to contain an account of "the progressive growth of the mathematics, from their infancy to the present time, and a comparison drawn between the ancients and the moderns; proving the high estimation they were held in by the former as comprehending the whole circle of human learning; with an alphabetical account of the most eminent geometers and mathematicians, ancient and modern, and the works they have published; to which is added a Treatise on Magic Squares, translated from the French of M. Frenicle, as published in *Les Ouvrages de Mathématique, par Messieurs de l'Académie Royale de Science*, with several additions and remarks. A subject, though not very interesting in itself, yet which affords the mind a pleasing satisfaction in observing the wonderful properties of numbers."

That the work existed in manuscript there is every reason to believe; but that it was ever issued to the public is still open to doubt; although it appears, *as published*, in a list of the author's works at the end of my copy of Leybourn's *Mathematical Repository*, 1805. Most probably the chief reason for delay in the first instance would arise from Mr. Lawson's project of publishing a *variorum* collection of solutions by different contributors becoming known; and his own promotion, from being master "at the Commercial and Mathematical School in Salford, Manchester," to a professorship in "the Royal Military College at Great Marlow," may have ultimately led him to suppress

the publication, if ever the printing was completed. Shortly after the appearance of Mr. Lawson's *Dissertation*, Dr. Clarke commenced the task of giving solutions to all the problems and theorems in the "Collection;" and by the time the *Rationale* was published he had completed the series *geometrically*, with the exception of four propositions. A few of these were communicated to Mr. Lawson, and the whole were promised; but a considerable delay ensued from the circumstance of Dr. Clarke being then engaged in bringing out the second volume of his *Treatise on Perspective*. His solution of problem 4 is, perhaps, worthy of notice, inasmuch as it supplies an additional method (by means of radical axes) of considering a question which has already been discussed by other methods in Bland's *Geometrical Problems*, the *Educational Times*, and in my paper on *Bisectant Axes* in the *Diary* for 1853.

*Problem.*—Through two given points, either within or without a given circle, to describe another circle which shall bisect the circumference of the former.

*Analysis.*—Imagine that A B E F is the circle required to be drawn; produce the diameter of the given circle A B to meet




F E, a line joining the given points, F E, produced in V, from whence let a tangent be drawn to the given circle at T; and suppose a circle to be described through the points, E, F, T. Then, since A B E F are in the circle, by hypothesis we have

$$AV \cdot VB = FV \cdot VE = VT^2,$$

and V T is a tangent. But the point, T, is given by Prop. XII., *Lawson's Tangencies*, and therefore T V is given; also the points, A, B, and the circle, A B E F, are given; and hence the following

*Construction.*—By Prop. XII., *Lawson's Tangencies*, describe a circle to pass through E, F, and touch the circle (C). From the point of contact, T, draw the tangent, T V, and produce it to meet the line, F E, in V. Lastly, through the centre, C, draw V B A, and a circle through F E B will be that required.

*Demonstration.*—By the properties of the circle we have $AV \cdot VB = VT^2 = FV \cdot VE$, and consequently the points A, B, E, F, are in a circle, which evidently passes through the given points, E, F, and bisects the circumference of (C). Q. E. D.

In the *Educational Times* for October, the solution is conducted by "Geometricus" (Mr. Henry Buckley) according to the strict forms of the ancient geometry; and although the analysis is not quite so simple as by other methods, yet the entire paper is well worthy the consideration of the geometer, inasmuch as the author applies the properties of *bisectant axes* and this subsidiary problem to the construction of a series of interesting variations of the original problem.

During Dr. Clarke's residence at Manchester, he was, at different periods, the associate and the antagonist of Mr. Jeremiah Ainsworth, at that time "Head Master of the Mathematical School, Hanging Ditch." Both were occasionally in correspondence with the Rev. John Lawson, but the former gentleman at one time appears to have been envious of his neighbour's honour, and in a postscript to one of his letters he takes occasion to inform the author of the *Dissertation* that Mr. Ainsworth was in the habit of stating the amount of assistance he had rendered him when publishing some of his later tracts on the ancient geometry. How far this statement was borne out by the facts I have been unable to determine, but the published writings of Mr. Ainsworth fully prove his competency for the task. His acquirements in Pure Geometry have already been pointed out in a former note, and his correspondence to the *Manchester Journal* during the year 1771 affords conclusive evidence that the higher branches of astronomy had also engaged his attention. On the 11th May he formally introduces himself to the editor of that paper by an intimation that "if any of [his] ingenious mathematical readers can furnish [him] with a solution to the following question, it will much oblige, yours, &c., PHILO-MATHESIS."

*Question.*—Granting that for any given time the right ascension, the declination, and equatorial horizontal parallax of both the sun and moon may be found, and also the refraction corresponding to any visible altitude corrected for parallax: it is required to give precepts for calculating the visible distance of their centres, as seen from a given place on the surface of the earth, considered as an oblate spheroid, whose equatorial diameter is to its polar as B to A, and not making use of any method of approximation.

In a subsequent number of the *Journal*

Mr. Ainsworth furnishes a solution to his own question, at the commencement of which he observes, that "for the bringing out a solution with sufficient perspicuity, we shall find it useful to consider a sphere existing whose centre agrees with the centre of the earth, and whose superficies pass through the place of the observer. For the parallax on this sphere will readily appear to agree with the whole parallax on the spheroid, and its zenith will determine the direction thereof. Then our business will be to inquire what the latitude of the place is on this sphere, and what the horizontal parallax, both of which may be determined from the well-known properties of the ellipse, and thence by the doctrine of the sphere, the zenith-distance, and azimuth. From the former of which, corrected for parallax, together with the latter, which is not at all affected thereby, and the latitude given in the question, we may also determine the distance from the zenith of the spheroid and the azimuth, both corrected for parallax. Then by allowing for refraction, the visible altitude and azimuth will be had." From these principles a series of six "easy rules are deduced, in which, according to the condition specified in the question, not any method of approximation is made use of." At the close the author remarks, that "by means of this problem eclipses of the sun, transits, and occultations of the stars by the moon, may be calculated to a degree of exactness superior to any method hitherto made public, and consequently the question is not altogether unworthy attention. The manner is indeed very laborious, but this is a circumstance which can seldom be avoided in astronomical calculations when we wish to be accurate."

Shortly after the appearance of this essay, Dr. Clarke took objection to some of its details, and in a letter dated "June 21st, 1771," infers that the preceding question was proposed "by Mr. Ainsworth, *son prochain ami*, in order to sound the depth of his Lancashire mathematical contemporaries. If this was the case," he proceeds, "the solution was, perhaps, given too precipitately, since it may have debarred him from judging of the abilities of his brethren by their methods of investigation." It must, however, be admitted, that these objections have little weight. They relate principally to the different values given by Newton and Maupertuis to the ratio B:A, and must have been urged more on the principle of having a word or two to say on the subject than from any conviction of their affecting the truth of Mr. Ainsworth's conclusions. Indeed, at the close of the letter, Dr. Clarke admits, "with due deference to Mr. Ainsworth's merit, that were the earth a perfect spheroid, the problem would be of great utility, the rules being very ingeniously deduced, and are a proof of his superior mathematical erudition." The next *Journal* contains Mr. Ainsworth's reply. He commences by observing, that "from the manner in which he introduces the subject, one might naturally think that Mr. H. Clarke himself could have given a solution to the question, had sufficient time been allowed him; but of this we shall, perhaps, soon find no little reason to doubt." The measures of Norwood, Clairault, Picard, Juan, and others, are then commented upon, as tending to prove "that Sir Isaac Newton was not much out in his calculation; and, be that as it will, my arguments will not be found to depend thereon." At the close he concludes, "that Mr. H. Clarke is but little acquainted with the subject he here ventures to turn critic in;" and begs "leave to propose another question, in the solution of which Mr. H. Clarke may, if he pleases, show his mathematical abilities; and, in the meantime, [he] shall remain his very humble servant, Jeremiah Ainsworth.

*Question.*—It is required to find the values of $x$ expressed in terms of $a$, $b$, $c$, $d$, and $m$, from the equation, $x^5+ax^4+bx^3+cx^2+dx+m=o$."

This controversy, as might readily be inferred, came to a conclusion with the proposal of the general equation of the fifth degree. Dr. Clarke made no attempt to gratify the curiosity of his antagonist, and its solution, except by considerations beyond the power of elementary algebra, still remains a desideratum. When certain relations exist between the co-efficient and the absolute term, the equation admits of finite algebraical solution. Two such relations are given by Dr. Clarke in his *Rationale*, which have since been transferred to the pages of the *Educational Times*, forming question 729 of that meritorious periodical. In the *Lady's and Gentleman's Diary*, question 1800, another of these particular cases may be seen, and the student may also derive considerable profit by consulting the proposer's (James Cockle, Esq., M.A.) interesting paper on its *subsidiary* solution in the appendix to the *Diary* for 1851. When one of the roots of an equation of the fifth degree has been anyhow determined, the remaining roots may be found very rapidly by the formulæ given by Mr. Beecroft in pp. 46-7 of his "General Method of finding all the Roots, both Real and Imaginary, of Algebraical Equations without the Aid of Auxiliary Equations of Higher Degrees." The investigations of these formulæ are not given by their author, but are promised in an appendix during the present year, toge-

ther with many other generalizations of primary importance to mathematicians.

Finally, in the *Philosophical Magazine* for February, 1852, G. B. Jerrard, Esq. is a "second time brought to the conclusion, which, guarded as it now is and fenced round on every side, must soon approve itself to mathematicians;—"*that the roots of the general equation of the fifth degree admit of being expressed by finite combinations of radicals and rational functions.*" These expressions, however, are not given *in extenso*, nor does it seem to promise an easy task for any who may attempt to deduce the *working forms* for the general equation.

A subsequent number of the *Journal* contains a question respecting an annuity for four lives, proposed by T. M. (Thomas Molineux), and also an inquiry—"Whence arises the inequality of *Natural Days*, and how may we correct it?" The latter query is raised by a correspondent bearing the signature "Chrononmononpublicus," and was probably Mr. Clarke himself, inasmuch as T. M. was then his pupil, and he hopes by an explanation of "this seeming mystery to be enabled to get a little forward in the pursuit of so useful and entertaining a science [as Astronomy]." Mr. Oliver Lomax, of Spen Moor, near Bury, replies to the annuity question, and Mr. Ainsworth answers both that and the astronomical query.

He attributes the inequality to "two causes, one of which is the irregularity of the sun's visible daily motion in the ecliptic, and the other the obliquity of the ecliptic to the equator." From the fulness of the answer, and the care taken in citing Ferguson and Kiell in support of his opinions, it is evident that Mr. Ainsworth was aware whence the query had proceeded. No allusion whatever is made to Dr. Clarke either in the introductory remarks or in the body of the reply; but it is not at all improbable that this was intended by "Chrononmononpublicus" as a set-off for the general equation of the fifth degree.

(*To be continued.*)

## HINTS ON THE CONSTRUCTION OF A PERPETUAL THERMOMETER.

BY MR. C. J. RECORDON, OF CAMBRIDGE.

A thermometer, giving the temperature of the medium surrounding it at every instant of time, might well be called a *perpetual thermometer.* But to fully deserve this name, it ought not to require continual observation, but should act by itself, or register itself perpetually.

I need not point out how desirable it would be to possess such a thermometer, especially for the purposes of meteorology. I intend only to show the possibility of executing such an instrument, as I am not aware that it has been done before, though the question presents no great theoretical difficulty. I am obliged to leave it to philosophical instrument makers and to mechanics to complete the plan of the instrument.

The accompanying engravings represent an apparatus I have devised, fig. 1 being a front view, and fig. 2 a side view of it. A C is a tube, of about an inch in diameter, which must be vertical and contain mercury. The bulb, B, must, of course, be proportionally large. On the mercury an iron cylindrical float, F, is put, of a diameter somewhat smaller than that of the tube, in order that friction may not be produced. This float must be about half an inch in height, so that it may have a certain weight, and descend freely with the mercury. In the centre of the float a light square rod is fixed vertically, passing out of the tube at C, where it must only incur just enough friction to prevent it revolving horizontally, and deviating from a strictly vertical direction. The rod is of about the same length as the tube, and a small tube is fixed horizontally to it at its extremity, D. In this tube a sharp pin may slide, which is acted upon by a weak spring attached at one end to the rod. By means of these contrivances the pin will always remain in the same vertical plane.

The second essential part of the instrument consists of a piece of clockwork, M, producing a uniform rotation of a vertical cog-wheel, E (of which the teeth must be very small), which communicates a uniform, horizontal, and parallel movement to a vertical thin plate, P P. This plate slides easily in grooves, cut in the piece, Q Q, on which it rests, and between two horizontal wires, W W, fixed along its upper part. The tube of the thermometer may be connected at C to the piece, Q Q, and the bulb may rest on a wire, G G, surrounding it. This latter wire is joined by supports to a horizontal plate, R R, on which the whole apparatus rests. The piece of clockwork and the support, Q Q, are attached to this plate by means of vertical light columns, S, and in this manner also the wires, W W, are connected to Q Q.

It is to be observed, that the piece of clockwork and the plate, P P, being placed higher than the tube of the thermometer, the latter is not protected on any side, and so can be exposed to the free action of the atmosphere.

It remains to graduate the plate: firstly, by vertical lines indicating the time, say in intervals of five minutes, so that these lines may coincide with the vertical line described

by the extremity of the pin, precisely at the times which they are intended to denote; secondly, by horizontal lines indicating the degrees of temperature. This graduation will be best effected by comparison with an accurate thermometer, in the common manner, the degrees being marked on some vertical line on the plate, at points corresponding to the different positions of the extremity of the pin. Through these points horizontal lines are to be drawn.

The apparatus may be so designed as to allow a graduation of twenty-four hours. Now, suppose that a transparent paper be fixed on the plate in four points, outside of the graduated rectangle; after twenty-four hours' working of the instrument, it will be found that a curve has been described on the paper by the pin; and if I have another paper, graduated beforehand, exactly as, or proportionally to the plate, the rectangles formed by graduation, both on the plate and on the new paper, may be small enough to enable me to describe at sight, on the latter paper, a curve equal or similar to that on the apparatus.

Fig. 1.

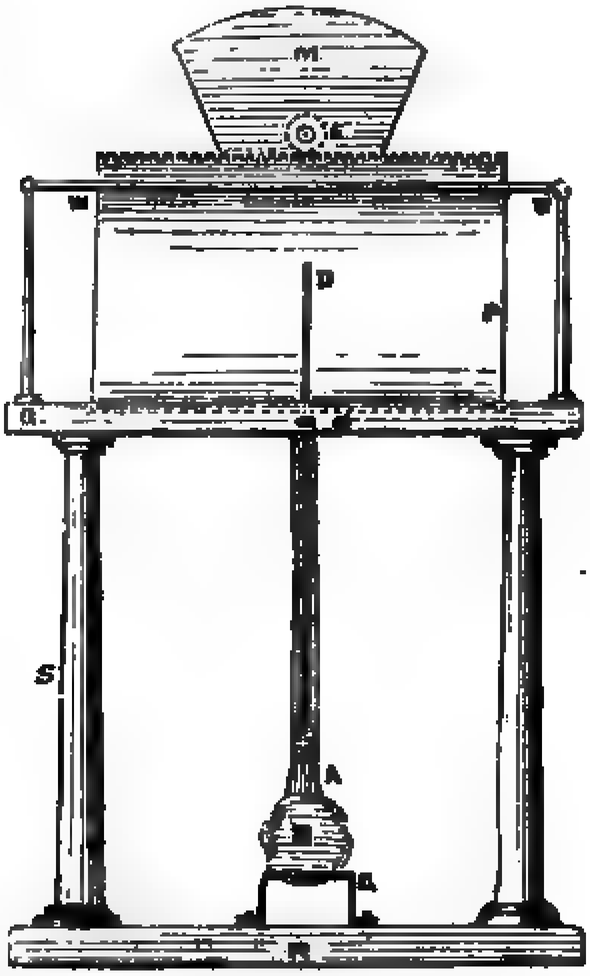
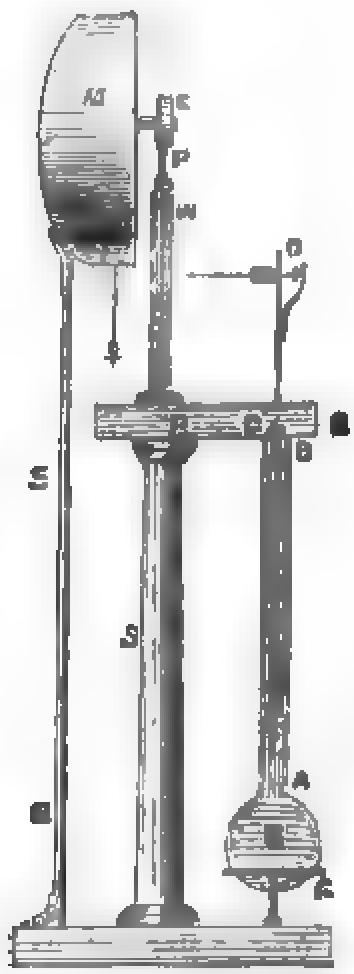



Fig. 2.




This curve may be called the *curve of temperature.*

The accuracy of the instrument will depend entirely on its mechanical execution.

The curve of temperature will be found especially useful for finding the *exact mean temperature* during twenty-four hours, or also during any other period. For this purpose find, by any practical method, the surface contained between the curve, the horizontal base corresponding to 0°, and the two vertical lines at the ends of the curve; divide this surface by the horizontal base: the quotient will be the altitude of a rectangle, whose base and surface are equal to those just mentioned, and will therefore represent the required exact mean temperature.

Supposing the piece of clockwork to go on twenty-four hours, the apparatus will only require to be visited at the end of that period, for the purpose of copying the curve of temperature, winding up the piece of clockwork, and effacing the curve on the transparent paper when it is once copied. The latter paper will require changing only after several days.

Graduated paper may be printed in large quantities; and the mere copying of the curve described on the apparatus will enable us to avoid all the usual notations of time, degrees, maxima and minima.

## MANUFACTURE AND APPLICATION OF PRODUCTS FROM COAL-TAR:—BENZINE.

*To the Editor of the Mechanics' Magazine.*

SIR,—I shall feel obliged by your allowing me to correct some historical errors in a passage, which appeared in your Journal for December 2nd, p. 533, col. 1. Mr. Calvert is there represented as having made the following statement in a lecture delivered by him before the Society of Arts on November 22.—

"When this rectified naphtha (from coal tar) had been submitted to a series of further purifications, it had received from an eminent French chemist, named Pelouze, the name of 'Benzine,' which had the property of removing, with great facility, spots of grease, wax, tar, and resin, from fabrics and wearing apparel, without injuring the fabric, its colour, or leaving any permanent smell or mark, as was the case with turpentine. Benzine had, through his (Mr. Calvert's) exertions, been introduced into England, and had been found most valuable in brightening velvets, satins, &c. The numerous uses to which this valuable product could be applied in manufactures, must, in time, render it of extensive employment in place of alcohol and other fluids."

I am not going to dispute the point that Mr. Calvert said all this in his lecture. I was not present on the occasion of its delivery, and have seen no other report of the lecture but that in your Journal. I have no business with the fact whether his words are correctly reported or not;—I have only to deal with the errors which I see in print.

One part of the passage which I have above cited is true, another is false. What is said of the utility of benzine,—that is to say of the substance "benzine," as Mr. Calvert must have meant,—not of the name "benzine," as he is made to say,—is true. What is stated of its history is false.

Benzine, Sir, is another, perhaps to some people a more convenient, name, for Benzole. The substance known by either of these names is not merely coal-naphtha purified. It is a certain definite hydro-carbon, as distinct a liquid as water, having peculiar properties of its own. This oil or spirit was discovered by Mitscherlich, the eminent German chemist, as a product of the decomposition of benzoic acid. To this substance, which, so obtained, is only an interesting and rather precious, chemical curiosity, Mitscherlich, not M. Pelouze, gave the name "Benzine." The name afterwards was changed by some German chemists to "Benzole," in conformity with a useful fashion of giving similar terminations to the names of compounds of similar nature. Substances which contain nitrogen, and confer alkaline properties on water, received the termination "in" or "ine;" the names of hydrocarbon oils were made to end in "ol" or "ole."

Again, not M. Pelouze but, I discovered that benzine or benzole could be prepared in large quantities from coal-tar-naphtha. It is not, however, so easy to obtain it thus in a state of purity, as to prepare it mixed with a small quantity of other hydrocarbons, which do not materially affect its properties. To this somewhat diluted product the name "Benzine" or "Benzole" may be given in practice, as we call a liquid containing spirit slightly diluted with water, "alcohol."

Again, I, and not M. Pelouze, nor Mr. Calvert, first observed the very useful properties which fitted this benzine or benzole for an abstergent of grease. Lastly, I, and not Mr. Calvert, made the "exertions" by which this most useful liquid was introduced into England. And I worked pretty hard at it, to the measure of my aptitude—"*badinage*" and Mr. Mushet (of your recent page 535) notwithstanding.—(Work, Sir, makes a sound-minded man cheerful, not snappish.)

All that, so far as I can learn, M. Pelouze has had to do with benzine, is, that he has taken advantage of the chaotic condition in which our patent laws were a few years back, and has turned another man's, to wit my, labour to good account. In 1847, it would cost a poor Englishman all his capital to secure patent-rights for his inventions at home, and would leave him nothing for the purchase of privileges abroad. I have been told that M. Pelouze is "making a good thing" of benzole in Paris; but I had been informed that not "Benzine," but "Essence Colin," or "Colla," or some such name, is the appellation which he has bestowed upon it.

Now, Sir, I am neither a dog in a manger, nor a fox at the grapes. Benzole has never yet yielded me anything but hard work, but I don't wish to prevent any brother-Frenchman, be he professor, or layman, from drawing much profit from my discovery. Neither will I say that French benzine, or essence, or income-in-francs, is or would be, sour, or otherwise unpleasant. But I must say that I should be very sorry to be receiving reward on either side of the channel, especially if I were a famous professor, for another man's work.

What Mr. Calvert has to do with benzine seems to me to be this. I learn from the *Chemical Gazette* for October 16, 1854, p. 399, that letters patent have been granted to Mr. Calvert for making benzine from coal-naphtha and from other similar matters, and for applying his product to the cleans-

ing of fur, wool, and woollen and other fabrics. And now Mr. Calvert appears to be making "exertions," by lecture and otherwise, towards "introducing" his patent to the public.

Now, however free any Frenchman, professor, or layman, may be to make and sell benzine in France, where I could not afford to buy a "*brevet*," I do not feel that Mr., or Professor, Calvert, is thoroughly welcome to walk in and claim my discovery, and the rewards thereof, in London.

Mr., or Professor, Calvert has made two discoveries:—first, that benzine or benzole may be made, by a certain simple process, from coal-naphtha;—second, that benzine or benzole so prepared will remove grease, resin, &c., from textile fabrics, &c., leaving no mark or permanent odour. Now, I do not know where, or how, Mr. Professor made these discoveries; but I may be allowed to state where or how he might have achieved them. He might have found them in print, thus:—In the *Quarterly Journal of the Chemical Society* for 1849, vol. i. in a paper written by me, entitled, "Researches in Coal Tar," at pages 257, 264, under the heads "Of the Preparation of Benzole from Coal Naphtha," and "Of a Practical Mode of Preparing Benzole," the first of his discoveries is ready at hand. At page 261 of the same paper, under the head "Of some Useful Properties of Benzole," his second point is indicated. Both these matters were farther exemplified in a pamphlet which was published for me in 1849, by Parker, West Strand, with the title, "Benzole; its Nature and Utility." As to the latter of them, Mr., or Professor, C. might have found at page 35 of this little book these words:—"As a solvent for grease of all sorts it (benzole) is unequalled, and its ready volatility may render it, in many instances, of extreme value as a detergent, disappearing as it does entirely after having done its work."

But further, Mr. C. might have gleaned from the pages of your excellent journal (*Mech. Mag.*, 1848, July 8, p. 43) a scrap of information, that might have been useful to him, to the effect that letters patent were granted to me on November 11, 1847, for the manufacture of, amongst other things, this benzole or benzine. He might also have found the whole specification of my patent printed in the "Repertory of Patent Inventions," for July and August, 1848. I did not therein specify, contenting myself with indicating (as at vol. xii. page 29, of said "Repertory"), the particular use of this *factotum* oil or spirit. I abstained from specifiying this and other applications of it, on the special advice of my patent agent that I should leave ground open for other persons to use my product; since the greater the number of free uses of it, the greater should be the demand for it. But to have "patented" all the uses of this wonderful substance, would have been to cover everything with my specification. Another person has recently taken out letters patent for another application of benzole,—the use of it in the manufacture of quinine. This was also pointed out by me in some of the passages to which I have above referred.

As Mr. Calvert has given to my property so very high a character, which, indeed, it truly deserves, I ought, perhaps, to feel somewhat obliged to him. I am glad, therefore, for his sake, that "letters patent" are cheaper now than such luxuries were in 1847. He will not have paid so much for his, I fear, useless possession, as it might have cost him if he had been earlier in the field. I am sure he will be obliged to me for correcting the errors into which he has fallen; and, I daresay, when he lectures again, he will give a true narration of the introduction of benzole, or benzine,—as he may prefer to call it.

I should, perhaps, also thank Mr. C. for informing me, as he does in the same page, which I have above cited, that "nitrobenzine," or nitrobenzole, as I used to call it, is "every day becoming more and more employed as a substitute for essence of bitter almonds, and used for flavouring dishes and communicating scents to perfumery, soap, &c." This substance was also one of the subjects of my aforesaid, still valid, patent. Of course I am glad that some one benefits by my labour; but specifying an invention under letters patent used to be rather an expensive mode of communicating information to the public.

The old patent-law fell hard upon poor inventors; it swallowed their means, and left them no cash-tools to work their projects, or money-weapons to fight the pirates.

Excuse the length and subject of this letter, Sir, and accept my best thanks for your space. Egotism is dirty work, and I am sorry to sully my pen or your pages with it; but streets must be swept, and mistakes must be corrected in the world.

I am, Sir, yours, &c.,

CHARLES BLACHFORD MANSFIELD.

Weybridge, December 5, 1854.

## MR. WAUGH'S WORK ON THE CALCULUS.

*To the Editor of the Mechanics' Magazine.*

SIR,—You justly stated, in your remarks on my last letter, that I am not very intimately acquainted with the history of ma-

thematics; I do not therefore desire to enter on a discussion of such length and weight as that with which you threaten me. Nor would it be convenient to the readers of your Journal to have repeated to them in your pages a controversy never very interesting, which has, probably, been previously exhausted, and recorded elsewhere. I will therefore content myself with saying, did Berkeley's objection possess any force at all, it might be directed with equal propriety against the use of general symbols altogether. For myself, I see no force in it.

I will venture, however, in abandoning the discussion of the main question, to request you to insert the following observations on the nature of velocity, in order, in some degree, to clear myself from the imputation of writing without previous reflection.

I. I cannot form any idea of the velocity with which a body may, at any instant, be moving which does not involve both the idea of an infinitesimal straight line, and that of an infinitesimal period of time. Here, I do not say merely that the mathematical expression $\left(\frac{ds}{dt}\right)$, for the velocity, conveys to the mind the clearest notion of what we mean by a body's rate of motion; but that, describe the velocity which a body has at any point of time in whatever language we please, our description must present to the mind the same ideas that are wrapped up in the little piece of notation $\left(\frac{ds}{dt}\right)$. I can very readily form a notion of this finite space traversed in a finite period of time, but I cannot conceive the velocity, finite or not, which a body possesses at a given moment of time, any more easily than I can the ultimate ratio of two vanishing straight lines. The idea of velocity, unlike that of a straight line, is a complex, and not a simple one; though it is not very easy to decompose. Let any one read the definitions and principles with which writers on mechanics commence their treatises, and he will soon see how difficult it is to convey or conceive the idea of velocity. Such a thing as an accurate definition of velocity cannot be found. One approaches the subject by saying that, "The motion of a body is swifter or slower, according as the space passed over, in a given time, is greater or less." And then that "The degree or swiftness with which a body moves, is called the velocity of the body." The fact is, they *cannot* define velocity; all they do is to give some synonymous words or phrases which may assist the advent of the notion in the pupil's mind. Here is a definition of uniform motion from the same writer—"When equal spaces are described in successive equal portions of time, the motion is said to be uniform." Perhaps one might think that the difficulty is not involved in this, but it is. For the definition is not correct unless the spaces and periods may be so small that there can be no variation in the relation of the time and spaces within them; that is, they are incapable of subdivision. With varying motion or velocity, the case is worse, of course. What is meant by saying that a stone has a velocity of a mile a minute at the instant of its being arrested? I do not see how it can mean anything, if it be not that the last corresponding infinitesimal time and space had exactly the same relation to each other that the mile and the minute have. Finite quantities cannot convey an accurate idea of even a finite velocity.

II. Since the conception of a finite velocity necessarily involves that of the relation of two vanishing quantities of different kinds, while that of the *ratio* $\left(\frac{dy}{dx}\right)$ has only to do with two quantities of the same kind, I think one may conclude that the idea of *a single* finite velocity is *at least* as difficult to form as is that of the ultimate ratio of two evanescent straight lines. That the ratio of *two* such quantities is a still more complex and unmanageable affair I need hardly say.

These, Sir, are my reflections on the subject.

I am, Sir, yours, &c.,
A MECHANIC.

## SMOKE NUISANCE.

[WE take this opportunity of giving place to the following observations which occur in the annual closing address recently delivered to the Liverpool Polytechnic Society, by its experienced President, James Newland, Esq. We publish them at the risk of diminishing the novelty of certain remarks of our own, which we feel called upon to offer when the debate progressing in our pages has ended.]

"The subject of smoke prevention had," says Mr. Newland, "long before occupied the attention of this society. So early as in 1842 it was fully discussed. In 1848, Mr. Williams read an admirable paper on the prevention of smoke, by insuring perfect combustion in furnaces, in which he

gave a clear exposition of the theory of combustion, and exposed many of the fallacies of those who had written and spoken on smoke combustion. The looseness and inaccuracy of this latter expression, smoke, combustion, he properly animadverted on and I wonder that it should ever be used by any one who knows the meaning of words; yet used it is, and has done an immensity of harm, and sent many on the search for that which is as visionary as the discovery of perpetual motion, and caused the expenditure of hundreds of pounds in securing patents for contrivances for the burning of smoke—contrivances founded on fallacy, and necessarily resulting in failure. Unfortunately, too, the legislature has adopted the term, and Acts of Parliament would compel us, like Hamlet,

> 'To strive with things impossible,
> Nay, get the better of them.'

The title of Mr. Williams's paper is clear and precise; the thing to be done is the perfect combustion of fuel; this effected, there will be no smoke.

* * * *

"That many of the contrivances, and their name is legion, which have been invented and patented, and reinvented and patented, to a certain extent, effect this is indisputable; but it is likewise indisputable that many of them do not do so at all, or, if at all, certainly not to an extent commensurate with the expense and trouble attendant on their introduction. * * * A paper on smoke prevention apparatus, classifying them in accordance with their principles of action, would show how many people have duped themselves into the belief that they have been inventing, while they have been only disguising the inventions of others, and would besides be of great practical utility now that a new stimulus has been given by the recent enactments of the legislature to inventions of this kind."

*To the Editor of the Mechanics' Magazine.*

SIR,—The decisions of the London magistrates, under Lord Palmerston's Act, appear to be so arbitrary (in fact, creating a greater nuisance to many industrious, struggling manufacturers than the smoke from their furnaces possibly could,) that either the law must be altered, or those who administer it must adopt some other principle for their guidance. In many of the cases, as reported, it appears the decision of the magistrates turned on the question, whether the offending parties had adopted some one or other of those patented contrivances for "the combustion of their own smoke." Now, it is not less than cruel to punish a manufacturer for not having done what nature and chemistry clearly prove cannot be done; and yet impose on him the alternative of a heavy penalty, or being at the mercy of the hundreds of those smoke-burning quacks who are thus enabled to reap a large harvest out of the ignorance of the public, who are left in the dark by the legislature as to the means by which the requirements of the Act may be satisfied. Under these circumstances, I have to request your putting on record, through your columns, the annexed letter on the subject under consideration, which appears in the *Morning Herald* of this day.

In point, and to show how unscrupulous are these pretenders, I may mention that in the *Times* of this day is an advertisement beginning with these words, viz., "Smoke Prevention.—Woodcock's patents are the only plans which prevent all smoke with perfect success." The sheer quackery of this is only equalled by the impudence with which Mr. Woodcock claims a patent right in what has been in successful operation during the last fourteen years; namely, the adoption of the Argand principle of introducing the air to the furnace in a *divided state*, and through a *perforated diffusion-plate*. I cannot, however, omit to notice that Mr. Woodcock has here repudiated the doctrine of his advocate, Mr. Mansfield, who, instead of "smoke-*prevention*," insists, on the smoke-*combustion* principle,—that smoke is at first made, and then consumed.

Of the serious chemical error of supposing that smoke is combustible, it may here be stated that Mr. Wright, C.E., and who, as "Government-inspector for the Smoke Nuisance" (see *Mining Journal* of this day), is looked to as an authority, observes, "Smoke cooled is soot; but when heated to 600 degrees of Fahrenheit, becomes highly inflammable gas, and is consumed." It is only necessary to say that every word of this dictum is erroneous. Smoke cooled, is smoke still. Soot is not as is there described, but is merely one only of the ingredients (and even the most inconsiderable) of the many products issuing from the furnace, and of which steam is by far the largest. An imperfect combustion taking place, the carbon of the gas is separated—chemically speaking, deposited — and is instantly and intimately mixed with the comparatively enormous volume of steam produced by the combustion of the gas. In that moistened state it adheres to the inside of the flues and chimneys, or passes away in the black cloud, the main ingredients of which are steam, carbonic acid, and nitrogen.

Again, it may be asked of Mr. Wright,

how, and when, and where, is this immense cloudy mass to be collected, or the insignificant small portion deposited, as soot, to be collected and raised to the temperature of 600 degrees? The most extraordinary, however, of the errors in the above dictum of the Government-inspector is, the assertion that soot, when heated, "becomes highly inflammable gas, and is consumed." That such an assertion could be now made, may well justify the Brandes and Faradays of our day in saying, as they do, that it is useless to attempt to set the public right, against the tide of charlatans, either of chemistry or medicine. Quackery deals with the ninety-nine unreflecting, while science and truth are received only by the remaining unit of the hundred.

Soot, or the carbon it contains, when subjected to combustion, instead of becoming a "highly *inflammable gas*," becomes *uninflammable* carbonic acid. The mischief, however, of all this is, that by perpetuating these errors, (and by authority, too), a direct encouragement is given to the plans and patents of the most ignorant, or the most unscrupulous pretenders. Thus, schemes are multiplied for effecting the supposed combustion of an incombustible, instead of doing what Argand did, effect the perfect combustion of the combustible gas, and thus produce no smoke to be burned.

I am, Sir, yours, &c.,
CH. W. WILLIAMS.

Liverpool, Dec. 9, 1854.

### THE SMOKE NUISANCE.

*To the Editor of the Morning Herald.*

SIR,—I have to request permission to notice an error which appears in your paper of this morning, in the report from the magistrates' court of Clerkenwell, under the head "Smoke Nuisance.—Important Information." The case arose in the prosecution of Mr. Stephen Dewell Keen, brewer, York-street, Camberwell, for "using a furnace not constituted to consume its own smoke."

Your reporter states that "Mr. Keen, in his defence, urged that he had used reasonable means to consume his smoke. He was, however, in treaty with Mr. Williams, partner of Mr. Woodcock, to arrange a new furnace, and he hoped that no fine would be inflicted at present." I beg to state that I am not the person with whom Mr. Keen is in treaty for a new furnace; that I am no partner of Mr. Woodcock's; on the contrary, all I know of that gentleman is, that he has recently patented a furnace for the supposed "consumption of smoke," but which I have, through the Institution of Civil Engineers, and the London *Mechanics' Magazine*, shown is an unqualified imitation, or re-invention, of my Argand furnace, the patent for which is now expired; and that Mr. Woodcock has no claim whatever to invention or patent right.

Having no interest in this matter, I am, nevertheless, anxious to see the nuisance abated, and at the same time to enable the unfortunate smoke-makers to effect their purpose without becoming the victims of the smoke-burning pretenders of the day. Looking to the peremptory character of Lord Palmerston's act, and the requirement of the magistrates, that "Some plan of smoke-burning be adopted," it is impossible not to feel commiseration at the position in which manufacturers are placed, and who are now brought under the operation of a new law, and for a new offence; while the legislature has afforded no information as to the means by which to avoid its penalties.

This also is the more embarrassing, seeing that the law actually requires the performance of an impossibility—namely, the burning, or combustion, or consumption of what is incombustible.

Mr. Corrie, the magistrate, while inflicting the penalty of £5, observed, "It cannot be too generally known that there are persons who are capable of giving assistance in the removal of the nuisance."

With equal justice it may be said that there are persons capable, or affecting to be capable, by their nostrums, of removing all complaints and curing all diseases. This dictum of the magistrate, however, has this effect—that it hands over the unfortunate smoke-making manufacturer to the host of smoke-burning pretenders and hot-air quacks which the amended patent law has brought, mushroom-like, into existence.

Impressed with a feeling of commiseration, I have written to many of those who, by your daily reports, appear to have been fined for an offence for which the magistrate himself is unable to point out a remedy, while he gravely tells the offenders that there are plenty of Morisons and Holloways ready to give their assistance. My object has been to show how I have for fourteen years been enabled, not to burn, but to prevent, smoke from chimney-stacks in thousands of cases.

I am, Sir, yours, &c.,
CH. WYE WILLIAMS.

City of Dublin Steam Packet Company,
Water-street, Liverpool, Dec. 6.

*To the Editor of the Mechanics' Magazine.*

SIR,—I beg to unite in Mr. Williams' commiseration of the luckless destiny of the smoke-makers. Many of the justices seem to be possessed with a favourite nostrum, and inflict not only a fine but a smoke-

burner also. I noticed that Mr. Aird, of the *Economist*, was thus sentenced to the "blind" economy of a Prideaux. But a greater aggravation of these manufacturers' misery seems on foot. There is, it seems, a Government inspector of smoke nuisances. I have no knowledge how this personage is constituted or appointed under the Act; but I perceive in the *Times* last week that such an official, by name Wright (*quasi* Wrong) has declared the remedy to be, the subjection of smoke to a temperature of 600°, when it is converted "*to a highly inflammable gas.*" It is very well known that in this country where private capital is paramount, first-rate talent is absorbed in private undertakings, and the mere wasters only, who can do nothing on their own account, are left to be picked up for the receipt of Government appointments; for which reason, among others, I was so strenuous an opponent of the Colliery Inspection Act. But where, in the name of all that is ludicrous, from what high-ways or by-ways, has the oracle been gathered up a *lux ex fumo*, to make the above assertion? It is high time that a "normal school" for smoke inspectors should be forthwith established in the Home Office, and proceedings under the Act stayed until the batch is ready to be drawn, or assuredly the Smoke Act, with such perplexities, will become not merely odious, but ridiculous. Mr. Williams in his last has placed the absurdity of these schemers at a climax, by exhibiting that they advocate the very same apparatus indifferently to make the air *either intensely hot* or *intensely cold.*

I am, Sir, yours, &c.,
DAVID MUSHET.

December 11, 1854.

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*To the Editor of the Mechanics' Magazine.*

SIR,—Whether your correspondent, Mr. Williams, with his praiseworthy exertions, has convinced Mr. Mansfield of the fallacy, or not, in the use of heated air in Mr. Woodcock's furnace, it would be difficult to decide, as Mr. Woodcock's silence leaves us perfectly at liberty to conjecture either side of the question. Certainly Mr. Woodcock has not ventured to refute such arguments by stating facts in opposition to them, neither did he in his supposed answer state any correct results of the experiments made.

* * * *

It is a false criterion to bring as an example the hot-air furnace used for smelting purposes; for it is well known that the air in this case is caused to pass through a considerable length of passage to obtain the required temperature; and there are positive means used to heat it to this. Can Mr. Woodcock or Mr. Mansfield state what the temperature of air would be, passing along these pipes, supposing it to enter at the atmospheric temperature, and the passage to be of a suitable length for ordinary furnaces, the temperature of which may be assumed as near the truth as possible? Will Mr. Woodcock just enlighten us upon this point? I am aware that air is more easily heated, or charged with heat, than water, but not to the extent or so easily as Mr. Woodcock wishes us to believe.

* * * *

I repeat again, there is little or no material, or distinctive difference between the two; the former (Mr. Woodcock's) has not been in operation for a sufficient length of time to prove its merits; the latter (Mr. Williams's) is an old-tried friend, and all smoke-preventive advocates are therefore warranted in using the remedy unless they are still willing to inhale the noxious gases given off by the chimneys in large towns. Allow me to say one word to Mr. Woodcock, as he was pleased to honour my former communication with special mention; let him be very cautious how he condemns the opinions of others, until he can advance more correct views of his own; and it would be well for him to read over your judicious remarks made at the beginning of the discussion of this question. And lastly, Mr. Mansfield's very learned theory goes for nothing, however great his title may be, unless it is supported by facts.

I am, Sir, yours, &c.,
ENGINEER.

Manchester, Dec. 12, 1854.

[The omissions made in "Engineer's" letter were rendered necessary in consequence of it having reached us late, and not on account of any irrelevance in his remarks, which we should have much preferred publishing at length.]

## ON THE ROTATION OF THE MOON.

[WE doubt not that many of our readers, who are more familiar with mathematical reasoning than with a certain class of ideas that prevail, almost exclusively, among mechanical persons, were surprised to find Mr. Mushet's letter, which opened the discussion on the above subject, inserted in our pages. "J. C." and "Tyro," for example, who evidently considered it scarcely worth their while to answer Mr. Mushet, must certainly have questioned our discretion in publishing his remarks. Did they, however, occupy our position at the present moment, they would become convinced of what we were perfectly aware of, viz., that Mr. Mushet

was uttering an opinion very prevalent among those who are more familiar with machinery than mathematics. We have before us numerous letters on the subject, and, with one exception (Dejere's), the whole of them are in support of Mr. Mushet's views, and therefore in contradiction to the received astronomical theory. One correspondent says, "When we say that the earth revolves round the sun and its own axis, we have an idea of two distinct movements, of which we can conceive either to be stopped without affecting the other. Not so with the moon; if we conceive its motion round the earth to cease, all idea of its motion on its axis is gone too, for it keeps the same place in its orbit, and the same face to the earth." Others write in a similar manner. These facts sufficiently prove that the discussion is one which may tend to improve the knowledge of some who need enlightenment.

The subjoined rejoinder of Mr. Mushet renders it needless, fortunately (for we cannot afford space for long and numerous letters on the subject), for us to present any other correspondence on the same side of the question in this Number; but we commend to our readers the latter paragraph of Dejere's letter, as containing suggestions calculated to throw much light upon the cause of the debate.]

*To the Editor of the Mechanics' Magazine.*

YOUR correspondent, "J. C." is right; I am not familiar with the visionary *méchanique céleste*, but more versed in practical and practicable mechanics. I also admit it is not easy to describe perspicuously what is unintelligible. I am not clear that I understand "J. C.'s" letter; but if I appreciate his illustration, he appears to assume that the axis of the moon's rotation coincides with the radius of her orbit; that as we look at her she is turning "end on," one pole pointing towards us, the other to the "everlasting stars."

* * * *

I pass to my next antagonist, very properly signing "Tyro." Leaving his considerable and considerably irrelevant personalities, which I think he will not risk again, I come at once to his apparatus of the man and the apple, or orange. How is the orange grasped in the hand to rotate on its axis? Must it be coaxed round with finger and thumb to conjure out the theory? and if so, how is the man in the middle to see the same side of the orange, when it has been turned away from his sight? If "Tyro" can so see it, he will exceed me very far as "a genius." It does not appear to me that "Tyro" understands the meaning of a rotation on an axis. The diagram is correctly drawn, and he rightly asserts that the effect "*is exactly as if the moon were rigidly connected with the earth;*" yet contradicts himself by the impossible assertion that a point in a circle, rigidly confined, *can revolve.* The moon in passing from the first to the second position of his figure, has no more rotation on axes, than the governor balls of a steam engine attached to rigid arms can rotate on themselves during their revolution. The line, *a b*, which he gives as the consequence of the *non-rotation* of his small circle, it is impossible to obtain except by *its rotation.* But to assume the rotation of a circle rigidly attached, is an impossibility; it implies that it is fixed and moveable at the same time, *quod est absurdum.* I must try to make "Tyro" understand this "simple" puzzle of rotation on an axis. Let him personate the earth, by standing in the centre of a circus, where a horse is galloping round. Now, where is the axis of a horse? He will see the same flank of the horse presented to him during the revolution; according to his theory, therefore, the horse must revolve or rotate on its axis. Yet the head goes always forwards, and the feet always downwards, the back is towards the ceiling, and its tail behind it. The same flank of the horse "will face all parts of the building in succession," and be seen by the upper circle, with their deities then representing the sidereal heavens; yet, nevertheless, the axis of the horse and its rotation will remain wanting. This notion, that facing all parts in succession is coincident with rotation on an axis, seems the ground of the confused images added as "another illustration." "Tyro" is not, perhaps, aware that this mode of proving the *astronomical* theory —walking, for instance, round a loo table, and trying to face its centre, and yet perform a pirouette at the same time—is by no means new. An opera dancer would give a decided opinion at once, whether her toe or her face were pointed to the pit, the whole period of rotation; but a *danseuse* not being a philosopher, philosophers have tried the experiment for themselves. Curious tales might be given of names of large calibre, authors of great treatises, recipients of their share of the Bridgewater booty, who have attempted to play the satellite precisely as "Tyro" recommends. In the absence of a multiple action-jointed neck, with proportionate face, the prodigy remained unaccomplished. Yet, despite of falls, both personal and mental, the delusion has not been recanted, but continues to be taught as *science.* Let "Tyro" take the advice I gave "Mechanic," and make the motion in *things,* not *words.* *Experiment is the only test of fallacies.* If he and every one else cannot make

two balls move, as the moon and earth are said to move, they cannot move so. What cannot be, is impossible.

I commend "Tyro's" assiduity in consulting the almanack to discover that the new and the full moon and the other changes do not occur always on the same day of the week and the same hour of the day; but, as I said at first, it is immaterial to the alleged action of the moon, whether the earth's rotation is zero, or 2,800 times, or the fraction of a time, during the period of her revolution. There is no competent practical mechanic among your readers who will attempt to controvert what I advance, provided he thinks and acts for himself, and can dismiss the awful idea that he is placing Herschel, La Place, and such long-handled celebrities in the wrong. It is most becoming not rashly to rebel against authorities. Yet this feeling will often lead men to sink their own convictions, and believe that those who profess to understand what is unintelligible, do so by force of a superior capacity, when, in fact, they have only gone beyond their capacity. The notable French definition of metaphysics is applicable to too many sciences; besides which, there is even an *esprit de corps*, when once enrolled under a certain banner. A geologist, for instance, when so entitled, feels bound in honour to swallow all the monstrosities with which he may be crammed by the authorities in command. When your correspondents have assimilated this startling problem of the moon, I shall be happy to supply them with indigestible food of more importance. Your excellent review of Waugh's "Improvements upon Newton," the clear perception of the innate difficulties of the calculus, its uses and abuses (the last, Legion by name), show you possess the right stuff for grasping truth upon its merits, whether it has a handle to lift it by or not. Follow the leader is not a good game when the leader is going wrong. Though this be professedly a great age of enlightened truth, editors cannot be found to print it, and men like myself have no time to string up systems of long pompous volume for publishers. I succeeded in effecting a lodgement in the *Times* three years since of an important letter at a cost of £10, when the public were favoured gratis with the scientific ilim of Sir George Cayley, Professor Hann, and others. I do not at all expect that political writers who have to regulate all the affairs of all the world, can be adepts in natural science, and competent to decide "where doctors disagree," and perhaps the visible length of the handle is the safest and readiest way of selecting out of a heap of articles. But the consequence is, that could I have afforded, for the sake of a subject in which I have no more interest than yourself or any other Englishman, to repeat so expensive an operation every week up to this date, I might have effected such a shaking, that every letter so paid for would have saved the nation a million in the present war. The best treatise upon "More Worlds than One" would be to prove there are other worlds of science than the little territory where professors happen to reign. The learned of his day had no faith in the new world of physiology which Harvey opened to view, and I have been much pleased with the independence of your late remarks, printed without fear of putting out of joint exalted noses.

I am, Sir, yours, &c.,
DAVID MUSHET.

P.S.—Let me add another illustration. As "Tyro" cannot be far removed from his school-boy recollections, he can no doubt remember sitting in a "merry-go-round" at a country fair. Now, will he demonstrate that he actually, while so seated, was revolving on his own axis?

December 11th, 1854.

[We have omitted part of Mr. Mushet's remarks in reply to "J. C.," as we were compelled to shorten the letter. They were opposed to the supposition that the moon is turning "end on."]

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*To the Editor of the Mechanics' Magazine.*

SIR,—If I am not mistaken, the discussion originated by Mr. Mushet's letter, in your Number for December 2, on the above subject, affords a notable example of a very general misunderstanding that exists between practical and theoretical men. I hope we shall not discover that it also furnishes an illustration of the inability which exists in each class to comprehend the difficulties, and to bear with the deficiencies of the other.

I am not surprised that to Mr. Mushet, and to other persons whose attainments are probably the results mainly of practice and observation, it appears an absurdity to state that, since the moon constantly presents the same hemisphere to the earth, she must rotate on her axis once during her monthly revolution. It would naturally appear so in the same manner, and for the same reason, that it would seem to them absurd to make the following, equally true, and perfectly analogous statements; viz., that St. Paul's Cathedral is perpetually spinning round the top of the golden cross on its summit; or that Lord Nelson, who apparently stands so demurely on his column in Trafalgar-square, is everlastingly employed

in throwing summersaults before the populace. Or, again, the moon revolves about its axis in the same fashion, and upon the same principle as that by which those individuals who dwell north or south of the equator, rotate about innumerable oblique axes, and thus describe an immense variety of cones (supposing they stand still for a day).

It certainly is true that the moon revolves about an axis passing through her centre of gravity; but it is equally true that she also revolves about any number of other axes, taken through any points of her substance. It is quite optional for mathematicians to split up the whole motion of a body into two others—one of translation, and another of rotation about a particular axis—and it is, doubtless, very convenient for their purposes to do so; at the same time, they should not allow their own familiarity with a *mathematical convention* to render them insensible to the difficulties that others may experience in comprehending it.

I have myself but little doubt that to Mr. Mushet, and to engineers generally, the word *axis* is always of the same import, and calls up the same idea as *axle*. If this be the case, their error is easily explained. The *geometrical conception* is confounded with a *material object*. It certainly would be impossible, after mounting a sphere upon an axle, to connect that axle rigidly with a central rotating sphere, and then to cause the first sphere to rotate about the axle, keeping always the same side to the central body. This, I presume, is the stumbling-block over which Mr. Mushet and his primary (as "Tyro" would say) Mr. Evan Hopkins tripped, before they tumbled so awkwardly into astronomical matters. Their accident is a caution and an admonition to us all.

I am, Sir, yours, &c.,

DEJERE.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

HORSFALL, JAMES, of Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of wire for pianofortes and other musical instruments.* Patent dated May 18, 1854. (No. 1104.)

This improvement consists in hardening and tempering steel wire for musical instruments previous to the final drawing, by which the wire is reduced to the proper diameter.

BEADS, JOHN, of Pendleton, Lancaster, manager. *Improvements in machinery or apparatus for preparing, spinning, doubling and twisting cotton, woollen, silk, linen, or other yarns.* Patent dated May 18, 1854. (No. 1105.)

This invention consists in forming the arm of the flyer flat or solid instead of tubular, with a small notch or guide-hole at its extremity; and of an improved mode of regulating the tension of the yarn by a peculiar drag made of woollen, cloth, felt, or any similar material, which rests on the bobbins in the creel as the yarn is taken from them to be doubled or twisted. This drag being on each bobbin, keeps every single thread on the stretch, so that when two or more of them are doubled or twisted, each thread having the same amount of tension, makes the doubled thread stronger and better than it would be if any of them were slack.

HINE, THOMAS CHAMBERS, of Regent-street, Nottingham, architect. *A new method of applying glass in the ornamentation of chandeliers and other fittings required for gas, candle, oil, or other artificial light.* Patent dated May 18, 1854. (No. 1106.)

*Claim.*—The employment of glass, beads, or other like objects threaded or strung on to metal or other tubes, chains, rods, or wires, so as to form a complete continuous covering thereto.

MARCH, JAMES COLLEY, of Barnstaple. *Improvements in vices.* Patent dated May 18, 1854. (No. 1109.)

The object of the inventor is to construct vices in such manner that the jaws shall move parallel to each other. We propose giving an engraving of the improved vice hereafter.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in printing telegraphs.* (A communication.) Patent dated May 18, 1854. (No. 1110.)

This invention consists in the employment of wheels situated at each of the corresponding stations, which are caused to revolve at the same speed. A series of keys, with the requisite letters or characters marked thereon, are employed for conveying the intelligence. The apparatus for breaking and establishing the circuit consists of an escapement-wheel driven by clock-work, and insulated at the part connected with its carrying-shaft. The printing mechanism is actuated by clock-work and an escapement-wheel, similar to the telegraph, and driven at the same speed also. The wheel containing the signs or characters in relief is carried on the same arbor as the escapement-wheel; it is kept in contact with an inking-roller, which is made hollow, and carries the colour inside. The surface of the roller is covered with gutta percha, which is pierced with a number of very small holes, to allow the colour to ooze out.

MACLEAN, JOHN, junior, and THOMAS FINLAYSON, both of Glasgow, Lanark, manufacturers. *Improvements in the manufacture or production of ornamental fabrics.* Patent dated May 18, 1854. (No. 1111.)

These improvements relate to a mode of producing ornamental coloured designs upon yarns or warps to be afterwards woven up into piece-goods, and consists mainly in the employment of apparatus for producing such designs by means of discharging agents acting upon a dye or colour previously imparted to the yarn.

CUNNINGHAM, JOHN, of Liverpool, Lancaster, architect, and WILLIAM ASHLEY, of the same place, ship-broker. *Improved apparatus for ventilating ships.* Patent dated May 18, 1854. (No. 1116.)

A description of this invention, written by Mr. Cunningham, was published in our current volume, on page 320.

GUICHARD, EDOUARD AUGUSTE DÉSIRÉ, of Paris, France, designer. *Improvements in the manufacture of ornamental fabrics for decorating walls, or other surfaces.* Patent dated May 18, 1854. (No. 1117.)

*Claim.*—"The production of ornamental designs upon paper hangings, by the employment of pulverized free-stone, sand, metals or metallic salts, saw-dust of all kinds of wood or shavings or cuttings reduced to fragments of greater or less fineness, paper reduced to powder, either by rasping or by trituration, talc, mica or other similar mineral substances, either alone or in combination with other matters, hemp and other textile substances, bran, straw, mosses, marine plants, lichens, and tan, also whalebone shavings or cuttings reduced to powder, or whalebone raspings, and lastly, baked earths of all kinds also reduced to powder."

HABERHAUFFE, JOHANN AUGUST, of Grossmuhlingen, Anhalt, Germany, gentleman. *Improvements in fire-arms and projectile weapons.* Patent dated May 19, 1854. (No. 1118.)

The inventor constructs a gun-barrel and corresponding bullet, "in such manner that the transverse sectional area of the bullet does not exceed three-quarters of the transverse sectional area of the barrel, but so that the bullet is guided by, and fits certain parts of the barrel, and is thus as effectually directed as if it were made to fill the barrel."

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, Finsbury, London. *Improvements in connecting the permanent rails of railways.* (A communication.) Patent dated May 19, 1854. (No. 1120.)

The inventor employs, in place of a wooden key, a cast-iron fish, which is kept in its place in the chair by an iron key, interposed between the chair and the fish. One side of the fish is made to fit exactly against the rail, so as to press against and support it; and the other side next to the chair is grooved out, so as to allow the key to fit in between it and the chair.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in looms for weaving.* (A communication.) Patent dated May 22, 1854. (No. 1125.)

*Claims.*—1. The use of two toothed templing rollers or toothed discs, whose pivots or axes have a suitable length, and are perpendicular or nearly so to the general surface of the cloth or fabric woven, in such manner that the points at the circumference of the said rollers pierce and stretch the cloth whose edge or selvage is caused to stand up by a moveable regulating finger. 2. The use of temples upon and above the cloth, or on the side opposite to the shuttle race, so as to allow the slay, cap, or race, to be fixed and worked at any height required.

CRIGHTON, WILLIAM, machine-maker, and ANDREW CRIGHTON, mechanic, both of Manchester, Lancaster. *Improvements in machinery or apparatus, technically called "beaters," used for opening, cleaning, or otherwise preparing cotton, wool, or other fibrous substances.* Patent dated May 22, 1854. (No. 1128.)

This invention consists in constructing the blades of beaters with corrugated or indented edges.

CROSLAND, ROBERT, and WILLIAM HOLIDAY, of Bradford, York, engineers, and JOHN HEATON, of the same place, foreman, moulder to the said Robert Crosland and William Holiday. *Improvements in apparatus employed in the manufacture of cast metal pipes or tubes.* Patent dated May 22, 1854. (No. 1129.)

This invention mainly consists in so arranging and combining apparatus employed in the manufacture of cast-metal pipes and tubes, that a number of moulding boxes may be supported upon a rotating or other traversing carriage, in order that the successive operations may be simultaneously performed with different moulding boxes of the series.

CROSSLEY, JOHN, of Newton-moor, near Hyde, Chester, manager, and WILLIAM CROSSLEY, of Failsworth, Lancaster, designer and card cutter. *Improvements in jacquard machines.* Patent dated May 22, 1854. (No. 1130.)

This invention consists—1. In an improved combination of parts, which form a double lift jacquard machine. 2. In coupling a long and a short hook, and causing them to pass through eyes in the same needle. By

this combination each thread of the warp can be raised or lowered as many times in succession as may be required. 3. In an improved combination of parts for giving motion to the jacquard cylinder of double-lift jacquard machines.

FASE, BERKELEY WILLIAM, of Charles-street, Soho-square, Middlesex, jeweller. *An improved construction of brooch for fastening dresses.* Patent dated May 22, 1854. (No. 1133.)

This invention consists in so constructing Celtic brooches, that the pins do not project beyond the frames.

ENGLAND, WILLIAM, of Dudley, Worcester, engineer. *Improvements in pneumatic and hydraulic wheels and fans.* Patent dated May 22, 1854. (No. 1134.)

The inventor employs plans similar to those used for blast furnaces, and wheels similar to those employed in marine propellers, the principle in the use of both being, that by means of the improved apparatus "a uniform current of air is maintained by the fan, without producing even a partial vacuum; and when used for hydraulic purposes, its action is direct upon the whole column of water presented to the fans or paddles."

SAUTTER, LOUIS, of Paris, engineer. *Improvements in lighthouses, and in lamps for lighthouses and other places.* Patent dated May 22, 1854. (No. 1135.)

The inventor claims an arrangement of the optical parts of lighthouses, so that they rotate on a central pivot; placing the apparatus for giving motion to the optical parts of lighthouses within the supporting column; and arranging lamps in which the oil is raised to, and caused to flow over at the burner, by the descent of a weighted piston in such manner, that the oil is maintained at a constant level in the supply vessel.

ROCHETTE, ANDRE PROSPER, of Brighouse, York, soap manufacturer. *An improvement in the manufacture of soap.* Patent dated May 22, 1854. (No. 1138.)

This invention consists in the application of greasy or oily matters obtained from suds and soapy waters in the manufacture of hard soap, by causing such matters, when melted, to be mixed with soda ley, and avoiding the boiling process, by which means a hard soap will be produced.

ORAM, ROBERT, and WILLIAM ORAM, both of Salford, Lancaster, machinists. *Certain improvements in hydraulic presses.* Patent dated May 22, 1854. (No. 1140.)

*Claims.*—1. The construction and use of an inner stationary ram having such a longitudinal proporton to the bore or chamber within which it works, that the limits of the traverse of the table or bed may not allow the intermediate or common ram to rise above the orifice or opening of the stationary ram. 2. The use of a certain double-stop or supply valve, and shutting the valves simultaneously by means of a screw.

BOSTOCK, CHARLES, of Manchester, Lancaster, manager, and STEPHEN GREENWOOD, of the same place, spindle maker. *Certain improvements in machinery or apparatus for cleaning and doubling silk.* Patent dated May 22, 1854. (No. 1141.)

This invention consists—1, in the use of a certain cleaner; and, 2, in the employment of elliptical or other springs in conjunction with spindles for the purpose of attaining steadiness and regularity in the revolution of the bobbins or spools, and also in a particular arrangement of the apparatus for stopping the supply-bobbins as required, and the use of a longitudinal lath or rail brushed with brass, or any other suitable material, for the purpose of carrying and lifting the bobbins, and thereby obtaining a high velocity.

## COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

CAULFIELD, WILLIAM BEARE, of Cole Harbour, Blackwall, Middlesex, steamboat owner. *The manufacture of brushes to be used in cleaning the small tubes of steam boilers, and for other purposes.* Application dated July 27, 1854. (No. 1653.)

The improved brush is formed as follows:—Two metal plates, of equal dimensions, and perforated with a convenient number of corresponding holes, are fitted to receive a spindle passing through their centres. In the holes of one plate are fixed rods, among which steel wire or other material is to be interlaced in small bunches; and in the other plate the holes are widened, so as to allow it to slide up or down upon the ribs. The spindle is provided with a shoulder and a screw-nut, between which the material contained within the plates is powerfully compressed and retained in its place. By relaxing the screw the material can be removed and replenished when necessary.

HARRIS, PETER GEORGE, of Buckingham-street, Adelphi, Middlesex, engineer. *Improvements in locomotive engines.* (A communication.) Application dated July 29, 1854. (No. 1671.)

The inventor describes certain means of combining or disjoining two parts of a locomotive at pleasure, &c., for the purpose of distributing the weight over several wheels, or of concentrating it upon a few, as occasion may require.

BURKE, EDMUND, of Upper Thames-street, London, gentleman. *Certain improvements in instruments for withdrawing corks*

*and in uncorking bottles.* Application dated July 29, 1854. (No. 1673.)

This invention mainly consists in combining, in a certain manner, a lever of the first order with a cork-screw, for the purpose of affording a readier means of withdrawing the cork.

LAWRENCE, THOMAS, of Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of bayonet-blades, and in machinery or apparatus to be employed for that purpose.* Application dated August 11, 1854. (No. 1756.)

This invention consists in forging the grooves of bayonet-blades by means of a tilt-hammer and suitable hammer-blocks.

BAUCKHAM, HENRY, of New-walk, St. John's, Southwark, Surrey, engineer, and HOWARD GLOVER, of the same place, engineer. *Certain improvements in constructing an apparatus or instrument for securing or fastening corks or stoppers into bottles or other vessels used to contain effervescing or other liquors, or wet or dry ingredients, and for other similar purposes.* Application dated August 19, 1854. (No. 1823.)

The inventors employ a collar or ring and a band, which passes over the former from one side to the other, and which is fitted to it by means of rivets or hinges, so that the band may be swung from over the cork and back into its position when necessary.

SCHWANN, THEODORE, of Neuss, Prussia, doctor in medicine. *Improvements in machinery or apparatus worked or actuated by helicals or spirals.* Application dated August 23, 1854. (No. 1850.)

The inventor describes certain forms of spirals, and employs "a syphon combined with a propulsive centrifugal or helical spring apparatus that shall give an impetus to the water contained in the syphon, causing it to ascend a little above the positive level of the two waters," &c.

SICARD, PIERRE AMABLE DE SAINT SIMON, of Paris, chemist. *Improvements in apparatus for raising and destroying submerged vessels, rocks, and other bodies; and also an apparatus to facilitate the examination of submerged bodies.* Application dated August 29, 1854. (No. 1894.)

These improvements consist—1. in constructing apparatus for attaching chains to submerged bodies by means of a screw put in rotation from the surface of the water, and apparatus for boring submerged bodies for the purposes of blasting, &c. 2. In forming apparatus for passing chains under submerged bodies, for the purpose of raising or moving them. 3. In combining an arrangement of apparatus for passing a chain round a submerged body, so that by means of other chains attached to the first, the body may be raised or moved. 4. In arranging certain apparatus to assist in the examination of submerged bodies.

HEATHER, JOHN, of Bedford-court, Covent-garden, Westminster, surgeon's instrument-maker and cutler, carrying on business under the name of William Blackwell. *An invention consisting of sugar-nippers combined with sugar-tongs, to be used for the purpose of cutting or breaking lumps of loaf and crystallized sugar, and distributing the same at the tea and breakfast table, to be called "Blackwell's combined sugar-nippers and tongs."* Application dated August 31, 1854. (No. 1904.)

The inventor places steel or other hard blades or wedges on the inner sides of sugar-tongs near their upper parts.

PROUST, PIERRE ETIENNE, of Orleans, department of Loiret, France. *A new system of apparatus for greasing or lubricating axles and other rotating portions of carriages and of machinery.* Application dated October 11, 1854. (No. 2173.)

The lubricator described by the inventor consists of an air-tight reservoir containing water, which being heated by the friction of the rotating portion, is caused to pass through a syphon into a box containing the lubricating matter, and there to mix with it and form a soapy compound which is fed to the axle.

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

COULSON, WILLIAM, of Fetter-lane, York. *Improvements in machinery for mortising and tenoning.* Application dated May 18, 1854. (No. 1102.)

This invention consists in the construction of mortising machines, in which the knife or cutter is made to descend by a hand lever, which actuates it by the intervention of a screw-wheel furnished with a counterbalance weight.

MILLER, WILLIAM, of Musselburgh, Midlothian, starch manufacturer. *Improvements in bleaching flax, hemp, and other fibrous substances.* Application dated May 18, 1854. (No. 1107.)

This invention consists in dispensing with the ordinary preliminary process of steeping or boiling the materials intended to be bleached or cleansed, and in putting them at once into a simple solution of chloride of lime instead of the ordinary solution of chloride of lime and vitriol used as a secondary process.

MAGGS, OLIVER, of Bourton, Dorset. *An improvement in applying shafts to agricultural implements and carriages.* Application dated May 18, 1854. (No. 1108.)

In this invention the shafts are attached

by pin-joints to the implements or carriages, and they have each a curved bar passing through them perforated with holes; and when the shafts are to be adjusted to a higher or lower horse, or other animal, they are raised or lowered to and fixed at a suitable position.

ROBERTSON, JAMES CURLE, of Glasgow. Lanark, merchant. *Improvements in the preparation and roasting of coffee and other substances.* Application dated May 18, 1854. (No. 1113.)

The inventor constructs a roaster consisting of the ordinary revolving roasting cylinder, in which the coffee is placed, actuated in the usual manner; but instead of being exposed to the dried heat of the fire, it is encircled by another fixed cylinder, to which the heat is applied, leaving an air-space between the two.

HINCHLIFFE, JOSEPH, junior, of Dam Side, near Halifax, York, cotton spinner. *Certain improvements in apparatus for regulating or governing the speed of steam-engines.* Application dated May 18, 1854. (No. 1114.)

In connecting the governor to the valve, the inventor employs two short rods, each being furnished at one end with a screw, the one left, the other right-handed, working in a box or tube containing corresponding right and left-handed female screws; the box or tube being acted upon by appropriate gearing from the shaft, or any other moveable part of the ordinary governor.

FEUILLATRE, ETIENNE JACQUES, gentleman, of Paris, France. *An improved apparatus for cleansing the wheels of carriages.* Application dated May 19, 1854. (No. 1119.)

The inventor forms a trough covered on the interior with brushes. This trough is passed under the wheel, which is raised up for the purpose, and which is then allowed to come in contact with the brushes. Water is poured into the trough, and the wheel is turned round until the tire and felloes are cleansed.

GLADSTONE, THOMAS MURRAY, of the Irwell Works, Salford, Lancaster, engineer. *An improved traverser or machine for shifting railway carriages from one set of rails to another.* Application dated May 19, 1854. (No. 1121.)

This invention consists in mounting on suitable bearings, sunk beneath the level of the rails, four or more sets of traverser rails, which are connected by an endless chain or band, and each of which sets, when in the proper position, presents itself on a level with the permanent way. The endless chain being worked, causes the shifting traverser rails to travel over and under, or round the bearings upon which they are supported.

RANDS, CHRISTOPHER, of the Steam Flour Mills, Shad Thames, Surrey, miller. *Certain improvements in machinery for regulating the feed of millstones.* Application dated May 18, 1854. (No. 1122.)

The inventor transfers the grain or other substance, as it falls from a hopper, by means of a rotating screw, to the shute which guides it to the eye of the runner or upper stone, and this screw is driven by a friction wheel on the screw-shaft running in contact with the face of a disc keyed to the spindle of the runner, and is adjustable on its shaft, and may be set by means of a forked lever to any required position.

ALLETSON, Thomas, of Moorgate-street, London, gentleman. *Improvements in the construction of flues and chimneys for steam engine boiler furnaces, and other furnaces.* Application dated May 22, 1854. (No. 1123.)

This invention consists in forming flues which alternately ascend and descend on their way to the shaft.

ROSE, KOSMAN, of Commercial-road, Stepney, Middlesex, japanner. *Improvements in buttons.* Application dated May 22, 1854. (No. 1124.)

The inventor attaches to buttons metal stems, which are passed through the material to which the buttons are to be attached, and then expanded.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in pianofortes.* A communication.) Applicationdated May 22, 1854. (No. 1126.)

The inventor arranges, among other things, for playing in octave accompaniments with the same key and hammer, and for playing one or more octaves at the same time, by introducing for the upper octaves extra strings and bridges, arranged in front of, or within those at present in use.

CHURCH, WILLIAM, of Birmingham, Warwick, engineer. *A new improved projectile.* Application dated May 22, 1854. (No. 1127.)

The inventor so arranges his projectile that the first effect of the ignition of the gunpowder is to urge forward a sabot, so as to bring the edge of the shot nearer to the bottom of a groove in the sabot. By this action an inclined outer face of the edge of the shot wedges against an inclined face of a groove, and causes the expansion of the sabot. A certain ring is thereby made to engage in the rifle-grooves, and thus a rotary motion is given to the projectile.

BLAKE, JOHN, of Greenock, Renfrew, engineer. *An improved shackle-hook.* Application dated May 22, 1854. (No. 1131.)

The object of this invention is to support the joint of the hook, and thus to prevent it from unbending when exposed to a great strain. This is effected by means of a loop, link, or tie-rod, which forms part of the shackle, and is so placed that when the strain is upon the hook, the point of it enters the loop or link, and is thus supported.

BALBIRNIE, ROBERT ANSTRUTHER, of Great Malvern, Worcester, gentleman. *An improved mode of mounting ships' compasses.* (A communication.) Application dated May 22, 1854. (No. 1132.)

The object of this invention is to neutralize the effect of local attraction upon compasses. For this purpose, the compass is encased in a covering of wire gauze, "which," says the inventor, "attracts the needle equally at all points, and yet renders its movements visible to the steersman or other person."

ROGERS, HENRY, of New Oxford-street, Middlesex. *Improvements in fire-arms.* (A communication.) Application dated May 22, 1854. (No. 1136.)

The inventor's fire-arm contains one barrel and several chambers. The back end of the metal frame is made to form part of the stock, and in it are fixed the main-spring, and also a spring which acts on the sear, which is formed in one piece with the locking-bolt that locks the revolving chambers, and prevents movement at the time of the discharge.

CLARK, FREDERICK, of King-street, Whitehall. *An improvement in fixing the spindles of door and other knobs and handles.* Application dated May 22, 1854. (No. 1137.)

This invention consists in forming the spindle of a lock with a slit or opening at one or both ends, and with ratchet or inclined teeth, so that the spindle can be introduced into a handle, the inclined teeth passing a spring catch or pall, till the length of spindle is adjusted, and then the spring catch retains the spindle.

SPENCER, JOSEPH BLAKEY, of the Shooter's-hill-road, Kidbrook, Kent, and ARTHUR JAMES MELHUISH, of Bowater-place, Greenwich. *Improvements in photographic apparatus.* Application dated May 22, 1854. (No. 1139.)

The inventor constructs apparatus by means of which a person may more conveniently carry out and use any quantity of prepared paper, so as to obtain in succession a series of photographic pictures, the parts of the paper-surface not in use being rolled up within the frame for the camera.

STOREY, THOMAS, of the Phœnix Foundry, Lancaster, engineer. *Improvements in stench traps.* Application dated May 22, 1854. (No. 1142.)

This invention consists in the employment of an inclined spout placed immediately under the grate, and attached thereto by small rivets. This spout consists of a dished plate, with an oblong opening in the centre, formed with a mouth-piece underneath projecting into the cess-box, and acting, when the latter is full, or nearly so, as a stench-trap.

*** No. 1112 has not yet been allowed.

## PROVISIONAL PROTECTIONS.

*Dated October* 10, 1854.

2168. George Wigzell Knocker, of Bushy Ruff, Dover, Kent, gentleman. Improvements in obtaining motive power by means of water.

*Dated October* 17, 1854.

2216. George Scheutz, of Salisbury-street, Middlesex, gentleman, and Edward Scheutz, of the same place, civil engineer. Improvements in machinery or apparatus for calculating, and printing the results of such calculations.

*Dated October* 18, 1854.

2225. William Eassie, of Gloucester, railway contractor. An improved means of securing goods or loading in or on railway trucks or wagons.

*Dated November* 9, 1854.

2374. John Halliday, of Stocks-street, Cheetham-hill-road, Manchester. An improved carding-machine for the purpose of carding cotton, wool, alpacca, mohair, flax, tow, silk, or any other fibrous material. A communication.

2379. John Berry, Richard Berry, and Thomas Berry the younger, all of Rochdale, Lancaster, machinists, and Thomas Royds, of Salford, in the same county, manager. Certain improvements in machinery for spinning, commonly known as mules.

*Dated November* 10, 1854.

2390. Eugene Antoine Lépine, chemist, of Madrid, Spain. Certain powders and collyrium for curing the diseases of the eyes without the use of surgical operations, to which invention he has given the name of "Lépine's Ophthalmological Powders and Collyrium."

2393. John Wain, of Greenacres Moor, Oldham, Lancaster, mechanic. Improvements in certain machines for spinning and doubling cotton and other fibrous substances of the kinds commonly known as mules and twiners.

*Dated November* 17, 1854.

2434. Richard Peters, of Union-street, Borough, Surrey, engineer. Improvements in steam engines.

*Dated November* 20, 1854.

2450. John Cumming, of Glasgow, Lanark, pattern-designer. Improvements in looms for weaving.

2452. Richard Keefe, of Nock-mills, near Trim, Ireland, miller. Improvements in dressing flour.

2454. William Bridges Adams, of Adam-street, Westminster, engineer. Improvements in projectiles, projectile weapons, and their appurtenances.

*Dated November* 21, 1854.

2456. Thomas Craig and Alfred Daniels, both of Manchester, Lancaster, warehousemen. Improvements in the mode or method of communicating signals on railways.

2458. Fisk Russell, of Massachusetts, United States of America. A new and useful machine for mowing grass.

2460. Alfred Tylor, of Warwick-lane, Newgate-street, London. Improvements in crimping-machines.

2462. William Lynall Thomas, of Anderton, Devon, gentleman. An improvement in projectiles and in gun-wads.

*Dated November* 22, 1854.

2464. Richard Terrett, of Hercules-buildings, Lambeth, Surrey, machinist. An improved machine or apparatus for cleaning knives.

2464. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the preventing or removal of incrustation in steam boilers. A communication from Nicholas Augustin Baudoux, of Paris, France, merchant.

2468. Charles Gibson, of Draycott, Wilne, Derby, gentleman. Improved machinery for manufacturing bricks, tiles, and drain pipes.

*Dated November* 23, 1854.

2469. William Hurst, of Salford, Lancaster, engineer. Improvements in railway chairs.

2470. James Wright, of Alfred-place, Newington-causeway, and John Walmsley, of the same place. Improvements in the construction and adaptation of bedsteads.

2471. William Aristides Vérel, of Macduff, Banff, merchant. Improvements in grinding or pulverizing bones.

2472. Edmund Eaborn and Matthew Robinson, engineers, and John Kendrick, accountant clerk, all of Birmingham, Warwick. Certain apparatuses or contrivances for holding hats in churches, chapels, and other public assemblies.

2474. George Collier, of Halifax, York. Improvements in the manufacture of mohair plush.

2475. George Collier, of Halifax, York. Certain improvements in the manufacture of pile fabrics and other weavings.

2476. Stephen Shaw, of Plaistow, Essex. An improved mode of marking metal plates for riveting or bolting, and the application of a new material as a template for receiving such marks.

2477. Jean Baptiste Heiller, manufacturer, of Schelestadt, French empire. Certain improvements in machinery for throwing or twisting cotton, wool, flax, silk, and other fibrous substances.

2478. Charles William Ramié, of Jersey, gentleman. An improvement in straps for sharpening razors, surgical instruments, and other like articles.

2479. Henri Jules Duvivier and Henri Chaudet, both of Rue de la Glacière, Paris. Improvements in treating gutta percha.

2480. Erik Edlund, of Stockholm, Sweden. Improvement of electro-magnetic telegraph apparatus.

*Dated November* 24, 1854.

2481. Samuel Alfred Carpenter, of Birmingham, Warwick, manufacturer. A new or improved buckle or substitute for a buckle. A communication.

2483. Riley Cunliffe, of Accrington, Lancaster, surveyor. Improvements in machinery or apparatus for making or manufacturing bricks and tiles or other similar articles.

2484. Robert Willan and Daniel Mills, of Blackburn, Lancaster, machine-makers. Improvements in looms.

2485. James Hartley, of Sunderland. An improvement in the manufacture of perforated glass.

2486. Cyprien Marie Tessié du Motay, of Paris, chemist. An improvement in treating soap to obtain back the fatty or oily matters in their original state.

2487. William Eley, of Broad-street, Golden-square, Middlesex. An improvement in the manufacture of ball-cartridges.

2488. John Davie Morries Stirling, of Black-grange, Clackmannan. Improvements in the manufacture of metallic tubes.

2489. Henry Bessemer, of Old St. Pancras-road, Middlesex. Improvements in projectiles, and in guns or ordnance used for discharging the same.

2490. Thomas de la Rue, of Bunhill-row. An improvement in the manufacture of compositions suitable for printing-rollers, printing-ink, and flexible moulds.

*Dated November* 25, 1854.

2493. John Henderson, of Lasswade, Midlothian, gentleman. Improvements in the manufacture of carpets.

*Dated November* 27, 1854.

2497. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the construction of inkstands. A communication.

2499. Félix Delacour, of Paris, France. Improvements in fire-screens.

2501. John Crofts, of Birmingham, Warwick, manufacturer, and William Cartwright, of Birmingham, manufacturer. A new or improved cannon and projectile.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December* 12*th*, 1854.)

1704. Henry Gerner. Improvements in the construction of omnibuses, parts of which are applicable to carriages generally.

1708. Edward Hallen. Certain improvements in chairs, chair-bedsteads, and other seats and bedsteads.

1716. Charles Frederick Stansbury. Improvements in machinery for making rope. A communication from William Robinson, junior, of Warsaw, New York, United States of America.

1717. Charles Frederick Stansbury. Improvements in locomotive and steam boiler furnaces. A communication from Jonathan Amory and William Parrott, of Boston, Massachusetts, United States of America.

1718. Charles Frederick Stansbury. Improvements in cut nail machines. A communication from Thomas H. Barlow, of Lexington, Kentucky, United States of America.

1719. Charles Frederick Stansbury. Improved air-tight vessels. A communication from Robert Arthur, of Washington, United States of America.

1721. James Gathercole. Improvements in bordering or producing devices upon the edges of envelopes, letter paper, or other articles of stationery.

1724. Edouard Alexandre. Improvements in concertinas.

1734. Joseph Hulme. Improvements in apparatus for preventing the explosion of steam boilers, for measuring the pressure of steam and other fluids, and in heating water for the supply of steam boilers.

1738. Antoine Corvi. Improvements in musical instruments.

1745. William Armand Gilbee. Improvements in hydraulic machines. A communication.

1752. Edward Monson. New or improved machinery for manufacturing, cleaning, and polishing daguerreotype plates.

1755. Peniston Grosvenor Greville. Improvements in the manufacture of cards for working wool and cotton. A communication.

1768. Henri Louis Edmond Désiré Hennebutte. Improvements in the manufacture of varnishes.

1812. Peter Armand Lecomte de Fontainemo-

reau. Improvements in preserving corn and other dry seed. A communication.

1813. Peter Armand Lecomte de Fontainemoreau. An improved composition for fixing lithographs and engravings on canvass after being transposed or reproduced by a printing press. A communication.

1824. Joseph Barrows. A new or improved instrument to be used in cutting loaves of bread and other articles of food.

1849. William Shepherd Smith. Improvements in pianofortes.

1868. Henry Bessemer. Improvements in guns for throwing projectiles for naval and military purposes.

1953. Henry Lund. Improvements in propelling and steering vessels, and in the steam engine applied to these purposes.

2101. Thomas Collins. Improvements in manufacturing bricks and tiles.

2169. John Kershaw. Improvements in the manufacture of wrought iron railway-wheels.

2196. Anthony Bernhard Baron Von Rathen. Improvements in bakers' and confectioners' ovens, and in furnaces or fire-places connected therewith, parts of which improvements are applicable also to other ovens, furnaces, and stoves.

2203. Louisa Monzani. An improvement in brushes and brooms. This is the same invention as that for which letters patent were granted to her late husband, 20th June, 1854.

2213. William Wain. Improvements in the construction of screw-propellers.

2353. Andrew Peddie How. An improved machine for cutting metal rods and bars. A communication from John Gallagher, of New York, engineer.

2361. George Davis. Improvements in taps or cocks.

2382. Henry William Harman. Improvements in windlasses, capstans, crabs, cranes, and other machines or apparatus for raising, lowering, or moving heavy bodies.

2393. John Wain. Improvements in certain machines for spinning and doubling cotton and other fibrous substances of the kind commonly known as mules and twiners.

2402. Joseph Armstrong. Certain improvements in chairs and crossings for the permanent way of railways.

2415. Jean Marie Chevron and Charles Victor Frederic de Roulet. Improvements in machinery for manufacturing textile fabrics.

2429. Samuel Henton. An improved saddle.

2458. Fisk Russell. A new and useful machine for mowing grass.

2459. William Beasley. Improvements in the manufacture of gun-barrels.

2460. Alfred Tylor. Improvements in crimping machines.

2465. John Henry Johnson. Improvements in the manufacture of piled goods, and in the machinery or apparatus employed therein. A communication.

2474. George Collier. Improvements in the manufacture of mohair plush.

2475. George Collier. Certain improvements in the manufacture of pile fabrics and other weavings.

2480. Erik Edlund. Improvement of electro-magnetic telegraph apparatus.

2486. Cyprien Marie Tessié du Motay. An improvement in treating soap to obtain back the fatty or oily matters in their original state.

2489. Henry Bessemer. Improvements in projectiles and in guns or ordnance used for discharging the same.

2490. Thomas De la Rue. An improvement in the manufacture of compositions suitable for printing-rollers, printing-ink, and flexible moulds.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## PRIVY COUNCIL APPOINTMENTS.

The Judicial Committee of the Privy Council have appointed Wednesday, 10th January, 1855, at half-past 10, A.M., for the hearing of the petition of Edward Godson, of Aldersgate-street, London, ironmonger, assignee of the letters patent granted to Edward Foard, of Nicholas-street, Hoxton, Middlesex, machinist, for "an improved method or improved methods of supplying fuel to the fire-places or grates of steam engine boilers, brewers' coppers, and other furnaces, as well also the fire-places employed in domestic purposes, and generally to the supplying of fuel to furnaces or fire-places in such a manner as to consume the smoke generally produced in such furnaces or fireplaces," for England, 16th January, 1841; for Scotland, 16th July, 1841; and for Ireland, 28th August, 1841, praying for a prolongation of the before-named letters patent.

The Judicial Committee of the Privy Council have appointed Thursday, 11th January, 1855, for the hearing of the petition of George Lowe, of Finsbury-circus, London, civil engineer, for a prolongation of the patent granted to him for "improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating powers," 16th March, 1841.

## NOTICE OF APPLICATION FOR LEAVE TO FILE DISCLAIMER.

An application will be made to Her Majesty's Attorney-general by James Macnee, of Glasgow, Robert Bell, of Glasgow, manufacturer, Christopher Duckworth, of Glasgow, manufacturer, and Robert M'Nair the younger, of Glasgow, commission-agent, for leave to file a disclaimer and memorandum of alteration of parts of the specification of the patent granted to James Macnee, of Glasgow, Lanark, merchant, for "improvements in the manufacture or production of ornamental fabrics," dated 20th January, 1852.

## WEEKLY LIST OF PATENTS.

*Sealed December* 8, 1854.

1291. Antoine Louis Péter.
1313. Frederick John Julyan.
1340. William Brunton.
1385. Auguste Edouard Loradoux Bellford.
1423. Edmund Cockshutt.
1491. William Pole.
1758. Walter Blundell.
2009. Samuel Collins.
2024. Alfred Tylor and Henry George Frasi.
2073. John Simon Holland.
2173. Pierre Etienne Roust.

*Sealed December* 12, 1854.

1304. John Edwin Piper.

1307. Thomas Mara Fell and William Cooke.
1325. John Allin Williams.
1326. Auguste Edouard Loradoux Bellford.
1343. Charles Reeves and William Wells.
1356. John M'Innis.
1392. Robert Michael Letchford.
1394. Thomas Skelton.
1395. Richard Archibald Brooman.
1397. Richard Archibald Brooman.
1450. Peter Armand Lecomte de Fontainemoreau.
1459. Christopher Thomas Tiffany.
1483. Peter Armand Lecomte de Fontaiuemoreau.
1500. Henry Richard Cottam.
1503. Lorenzo Tindall.
1504. John Henry Johnson.
1519. Victor Gustave Abel Cuvier.
1543. John Baptist Chauvet.
1562. George Wade Kelsey.
1888. John Gray.
2103. Moses Poole.
2119. William Blythe and Emile Kopp.
2124. Christopher Nickels and James Hobson.
2143. George Collier.
2162. William Crosskill.
2174. Jean François Jules Alexandre Boullet.
2182. James Timmins Chance.
2204. James Hadden Young.
2228. Ernst Gessner.
2276. François Lambert.
2312. James Cooper Hall.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*G. R.*, Deeping.—We are not able to answer your question with satisfaction to ourselves.

*T. V.*—There are many ways of proving experimentally that any particular elastic fluid is capable of transmitting sound. If, for instance, the air be exhausted from a receiver in which an alarum has been placed, and the elastic fluid be gradually introduced, the sound of the alarum will become increasingly audible.

*R. V.*, *Senex*, and *Lux*.—Your papers are received with thanks.

## CONTENTS OF THIS NUMBER.



LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.

# Mechanics' Magazine.

No. 1637.] SATURDAY, DECEMBER 23, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.


## BROOMAN'S PATENT MACHINERY FOR CUTTING BRADS, LATH-NAILS, ETC

Fig. 1.

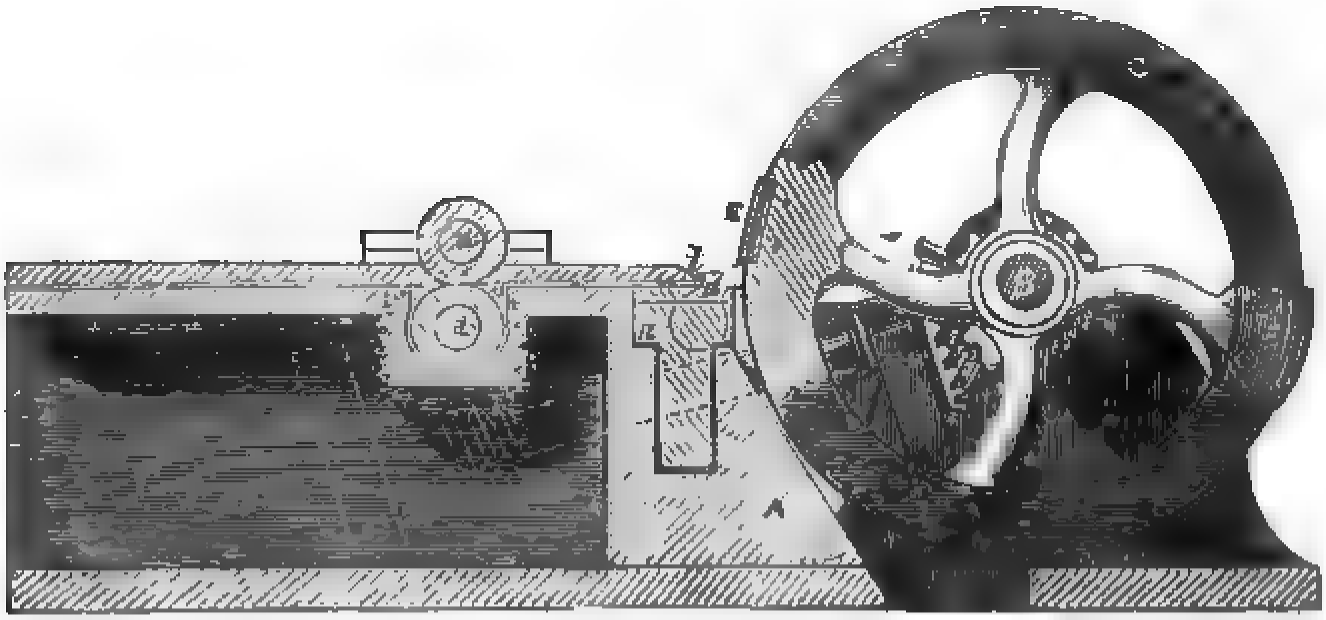


Fig. 2.

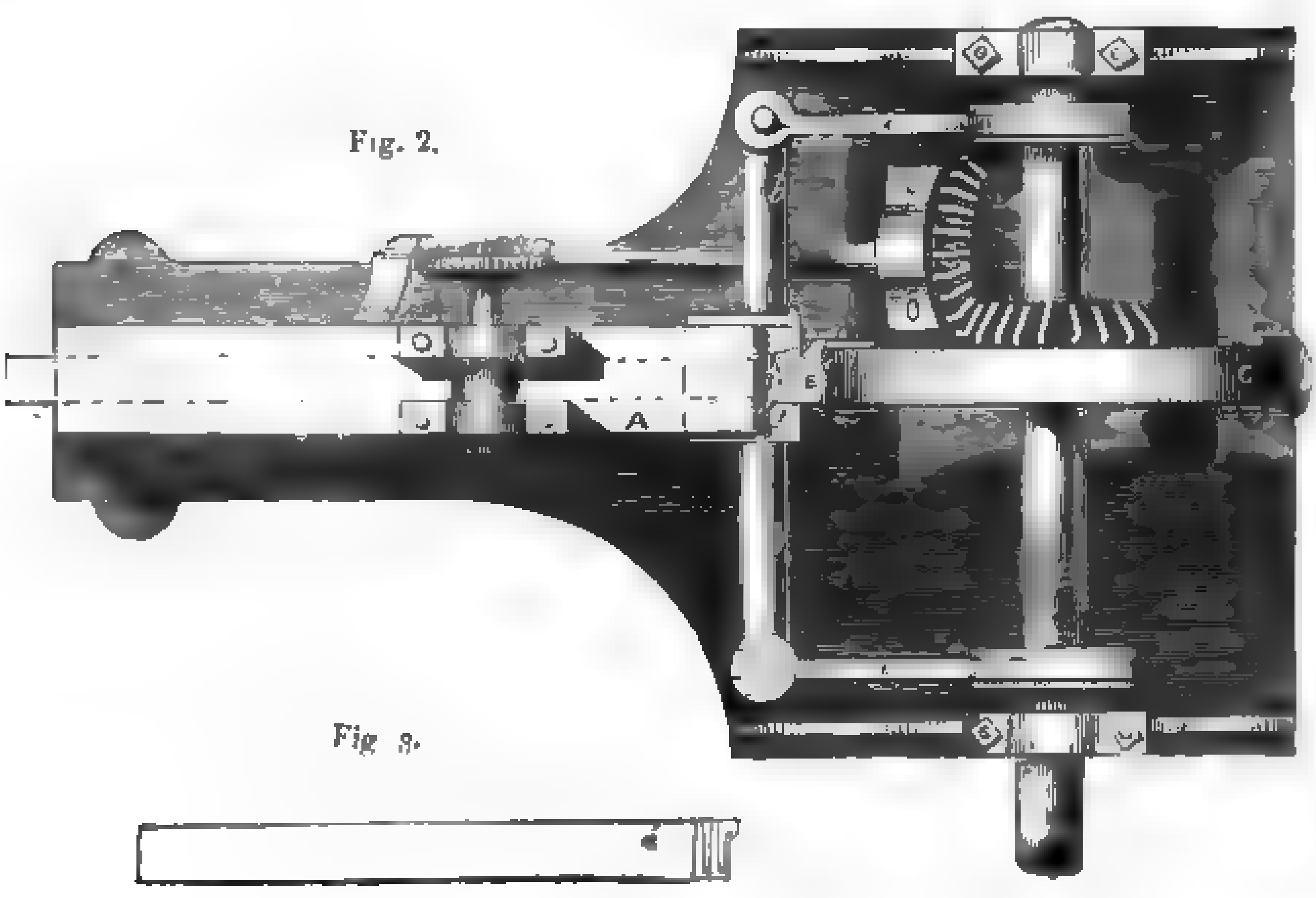


Fig. 3.

## BROOMAN'S PATENT MACHINERY FOR CUTTING BRADS, LATH-NAILS, ETC.

(Patent dated June 9, 1854.)

THE engraving on the preceding page represents a machine by which brads or lath-nails are cut from a sheet or ribbon of metal of a width suitable for making the length of one brad or nail and the head of another. The dies for cutting are of such shape as to give the proper taper; and in order to maintain a fair edge during the cutting up of the strip, the heads are formed alternately on each side, as seen in fig. 3. In the old machines, having vibrating cutters, the strip must be turned over each time a cut is taken off and a brad made, but by the invention the turning over is obviated, while all the time required for turning is saved, and a greater amount of work therefore accomplished. In this machine both parts of the shears or cutters move, one part revolving upon a heavy fly-wheel, while the other vibrates upon an axis at the inner corner of the anvil or bed; and it is by this arrangement of the vibratory shear or cutter that the plate may be fed in and cut up into brads without requiring to be turned at each cut.

The machine is constructed and worked as follows:—At *A* is a strong anvil or base block cast upon, or otherwise properly secured, to the bed-plate; in its top a cavity is made to receive a centre pin and fixture, on which the vibrating part of the shear is secured. To hold and operate this vibrating part there is a plate, *a*, having a pin or axis fitted to the recess in the base block, *A*, as shown; from its sides two arms, *b*, branch out horizontally across the machine, as seen in fig. 2; from the ends of these, connecting rods, *c*, extend to the main shaft, where they terminate in eccentrics, as is represented, the set of the eccentrics being such as to have their throw or greatest elongation on opposite sides of the shaft. This gives the vibratory motion to the shear plate. The vibrating part of the shear is a piece of steel, *d'*, faced upon the plate, *a*, and having its cutting edge, which is straight, slightly overhanging towards the rim of the wheel, as shown in fig. 1. At *B* is the main shaft supporting a heavy wheel, placed so that its face will be directed towards and be near to the edge of the vibratory part of the shear, the axis of the main shaft being on a level with the face of the shear. The face, at points on opposite sides, is cut away and fitted to receive two pieces of steel, each forming alternately the revolving part of the shears, as shown at *e* and *e'*. The edge of each of these revolving parts is shaped so as to stand at an angle with the face of the wheel, in order to cut the brad with the proper taper; and as the heads are formed alternately from side to side, so these angles are set in opposite directions, as shown at *e* and *e'*, fig. 2. The use of the vibrating part, *d'*, of the shear will now be apparent, for in order to make a clean cut, the two edges of the shear, viz., the vibrating and the revolving, at the moment of operating on the metal, must face or be parallel to each other, and so near as just to give to one of them passage by the other. As therefore the edge of the revolving shear, *e'*, approaches the sheet of metal represented at *i*, the edge of the vibrating part, *d'*, of the shear will be adjusted to lie parallel by the movement of the arms, *b*, operated by the eccentrics on the main shaft, as represented, and the brad is properly cut off, one edge of the shear coming down on the strip a little inside of its edge, whereby the head is formed, as shown by the dotted lines, and also as represented in fig. 3. The second rotating shear, *e*, now approaches, having its edge set at an angle in the opposite direction, and the edge of the vibrating shear must be turned so as to lie parallel with the revolving shear which is approaching, as in the former case. The arms, *b*, accordingly move to the position shown in the dotted lines, fig. 2, the throw of the eccentrics being set so as to effect it, and the opposite edge of *e* being also so set as to cut within the edge of the strip, in order to leave the projection for the head of the brad next to be cut, as before. The strip, *i*, of metal is fed along in a channel in a table, as shown, the onward motion being effected by two feed-rollers, *d*, operated by suitable gearing, and driven from the main shaft, in order that the velocities of the two shall always bear the given relation to each other demanded by the quantity to be fed, which must always be the same during the passage of one revolving shear to the other.

In making brads or nails of other shapes or sizes, the cutting shears must be changed, and others of the required form substituted. In the case of length, the channel on the table for guiding the strips must be widened. This is accomplished by setting apart the guide pieces by set screws or by any other convenient means.

## PROOF OF A GENERAL ALGEBRAICAL THEOREM.

*To the Editor of the Mechanics' Magazine.*

Sir,—The first question for the Smith's Prizes in 1853 was, prove that

$$a^2+b^2 > 2ab$$
$$a^3+b^3+c^3 > 3abc$$

$a, b, c,$ being real quantities not all equal. As these inequalities were considered of sufficient difficulty and importance for a place in the Examination for Smith's Prizes, and I am not aware that any proof of the general inequality of which the above are particular cases, namely, $a^n+b^n+\ldots\ldots+k^n > n.abc\ldots\ldots k$, has been published, it may be worth while to insert the following, which I discovered this morning.

Proof that

$$a^n+b^n+c^n+\ldots\ldots+k^n \text{ to } n \text{ terms} > n.abc\ldots\ldots k \text{ to } n \text{ factors,}$$

$a, b, c\ldots\ldots k,$ being real quantities not all equal.

First, let $n=2$; then $a^2+b^2 > 2ab$.

$$\begin{aligned} \text{For, if } a > b, \quad & a-b > 0, \\ a < b, \quad & b-a > 0, \\ \therefore \text{ in either case } a^2+b^2-2abc & > 0 \\ \text{and } a^2+b^2 & > 2ab \ldots\ldots\ldots\ldots\ldots\ldots (A. \end{aligned}$$

Secondly, whether $a$ is greater or less than $b$,

$$a^n(a-b) > b^n(a-b)$$
$$\text{and } \therefore a^{n+1}+b^{n+1} > a^nb+ab^n \ldots\ldots\ldots\ldots (B.$$

By the help of these two inequalities (A) and (B), we can prove that if the general theorem holds when there are $n$ quantities $a, b, c\ldots\ldots k$, it holds when there are $n+1$ quantities $a, b, c\ldots\ldots k, l$.

Assume that $\quad a^n+b^n+c^n+\ldots\ldots+k^n > n.ab\ldots\ldots\ldots k;$

then, leaving out $a, b, c$, &c., successively, and adding $l$, we get

$$b^n+c^n+\ldots\ldots\ldots\ldots+k^n+l^n > n.bcd\ldots kl,$$
$$c^n+d^n+\ldots\ldots\ldots\ldots+l^n+a^n > n.cd\ldots la,$$
$$d^n+e^n+\ldots\ldots\ldots\ldots+a^n+b^n > n.de\ldots lab,$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

and so on till $\quad l^n+a^n+\ldots\ldots\ldots\ldots+h^n+i^n > n.la\ldots hi.$

In these $n+1$ inequalities, each quantity $a, b, c$, &c., occurs $n$ times, being left out of one; therefore if we add them all together, and divide by $n$, we get

$$a^n+b^n+\ldots\ldots\ldots\ldots+k^n+l^n > ab\ldots k+bc\ldots l+\ldots\ldots\ldots+la\ldots hi;$$

multiplying each side of this inequality by the same quantity, $a+b+c+\ldots+k+l$, we get

$$\left.\begin{array}{l} a^{n+1}+b^{n+1}+\ldots\ldots+l^{n+1} \\ \quad +a^nb+ab^n \\ \quad +a^nc+ac^n \\ \quad +\ldots\ldots\ldots\ldots\ldots\ldots \\ \quad +a^nl+al^n \\ \quad +\ldots\ldots\ldots\ldots\ldots\ldots \\ \quad +k^nl+kl^n \end{array}\right\} > \left\{\begin{array}{l} (n+1)\,ab\ldots\ldots kl \\ +(a^2+b^2)\,cd\ldots\ldots kl \\ +(a^2+c^2)\,de\ldots\ldots lb \\ +\ldots\ldots\ldots\ldots\ldots\ldots \\ +(a^2+l^2)\,bc\ldots\ldots k \\ +\ldots\ldots\ldots\ldots\ldots\ldots \\ +(k^2+l^2)\,ab\ldots\ldots \end{array}\right.$$

which we will call (C.)

Now by (B) $\quad a^{n+1}+b^{n+1} > a^nb+ab^n$

$$a^{n+1}+c^{n+1} > a^nc+ac$$

$$\ldots\ldots\ldots\ldots$$
$$a^{n+1}+l^{n+1} > a^n l + al^n$$
$$\ldots\ldots\ldots\ldots$$
$$k^{n+1}+l^{n+1} > k^n l + kl^n$$

Adding all these inequalities together, observing that each quantity $a^{n+1}$, $b^{n+1}$, occurs $n$ times, we get

$$\begin{aligned} n\,(a^{n+1}+b^{n+1}+\ldots\ldots+l^{n+1}) > {} & a^n b + ab^n \\ & + a^n c + ac^n \\ & + \ldots\ldots \\ & + k^n l + kl^n \end{aligned}$$

nd $\therefore$ $(n+1)\,(a^{n+1}+b^{n+1}+\ldots\ldots+l^{n+1}) >$ the first side of our inequality (C.)

Again, by (A)

$$\begin{aligned} a^2+b^2 &> 2ab \\ a^2+c^2 &> 2ac \\ \ldots\ldots & \quad \ldots\ldots \\ a^2+l^2 &> 2al \\ \ldots\ldots & \quad \ldots\ldots \\ k^2+l^2 &> 2kl \end{aligned}$$

$$\therefore (a^2+b^2)\,cd\ldots\ldots l + (a^2+c^2)\,de\ldots\ldots b + \ldots\ldots + (k^2+l^2)\,ab\ldots\ldots hi$$

greater than $2ab\ldots\ldots kl \times$ number of pairs, which is the number of combinations of $n+1$ things taken two together, and therefore

$$= \frac{n+1}{2}.\,n$$

Hence $(a^2+b^2)\,cd\ldots\ldots l + \ldots\ldots(k^2+l^2)\,ab\ldots\ldots i > (n+1)\,n.ab..kl$

and the second side of C $> (n+1)^2\,ab..kl$

$\therefore$ *a fortiori* $(n+1)\,(a^{n+1}+b^{n+1}+\ldots\ldots+l^{n+1}) > (n+1)^2\,ab..l$

and $\therefore$ $a^{n+1}+b^{n+1}+\ldots\ldots+l^{n+1} > (n+1)\,ab..l$

if $a^n+b^n+\ldots\ldots+k^n > n.ab..k.$

But this is true when $n=2$, therefore when $n=3$, and if for 3, then for 4, and so on for any other number; that is, it is generally true. Q. E. D.

---

It may be more quickly shown that

if $a_1^n + a_2^n \ldots\ldots + a_n^n > n.a_1 a_2 \ldots\ldots a_n$

then $a_1^{2n} + a_2^{2n} + \ldots\ldots + a_{2n}^{2n} > 2n.a_1 a_2 \ldots\ldots a_{2n}.$

Assume $a_1^n + a_2^n + \ldots\ldots + a_n^n > n.a_1 a_2 \ldots\ldots a_n$

then, similarly, $a_{n+1}^n + a_{n+2}^n + \ldots\ldots + a_{2n}^n > n.a_{n+1} a_{n+2} \ldots\ldots a_{2n}$

Multiplying,
$$\left.\begin{aligned} & a_1^n a_{n+1}^n + a_1^n a_{n+2}^n + \ldots + a_1^n a_{2n}^n \\ & + a_2^n a_{n+2}^n + a_2^n a_{n+3}^n + \ldots + a_2^n a_{n+1}^n \\ & + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ & + a_n^n a_{2n}^n + a_n^n a_{n+1}^n + \ldots + a_n^n a_{2n-1}^n \end{aligned}\right\} > n^2.\,a_1\,a_2..a_{2n}$$

But by (A)

$$\begin{aligned} a_1^{2n} + a_{n+1}^{2n} &> 2a_1^n a_{n+1}^n \\ a_2^{2n} + a_{n+2}^{2n} &> 2a_2^n a_{n+2}^n \\ \ldots\ldots & \quad \ldots\ldots \\ a_n^{2n} + a_{2n}^{2n} &> 2a_n^n a_{2n}^n \end{aligned}$$

...... ......

$$a_n^{2n} + a_{2n-1}^{2n} > 2a_n^n a_{2n-1}^n$$

∴ adding, $$n\left(a_1^{2n} + a_2^{2n} + \dots + a_{2n}^{2n}\right) > 2\left(a_1^n a_{n+1}^n + \dots\dots + a_n^n a_{2n-1}^n\right)$$
$$> 2n^2.a^1a^2\dots\dots a^{2n}$$

and therefore $$a_1^{2n} + a_2^{2n} + \dots + a_{2n}^{2n} > 2n.a_1a_2\dots\dots a_{2n}$$

I am, Sir, yours, &c.,

Cambridge, December 2, 1854. F. J. CANDY, B. A.

## HINTS ON THE CONSTRUCTION OF A PERPETUAL THERMOMETER.

BY MR. C. J. RECORDON, OF CAMBRIDGE.

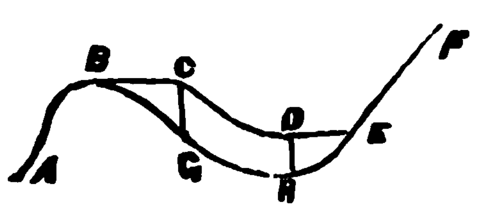
(*Supplement to article on page 583.*)

A shorter and perhaps better name for the apparatus described on the above page might be *thermograph* (heat writer).

We suppose that the graduation of the plate, P P, as to the degrees of temperature, was made from the bottom to the top, viz., whilst the temperature was constantly increasing; and we are certain that the indications of the apparatus will be accurate whenever such a state of temperature shall occur again; but when the temperature goes on decreasing, there will be the following cause of error, which must not be overlooked. When the rod ascends, the unavoidable friction at C, and that of the pin on the paper, acts downwards, and when the rod descends, the same frictions act upwards; therefore, in the second case, as compared with the first, an additional force, equal to twice those frictions (which have constant valves), acts upwards on the rod, and consequently for one and the same temperature of the atmosphere, the rod and the float will, at decreasing temperatures, be somewhat higher than they would be at increasing temperatures.

If, for instance, in the first case the rod, and therefore the pin, is on an average half a degree so high, the following will be the effect on the curve of temperature. Suppose the portion, A B (fig. 3), to indi-

Fig. 3.




cate increasing temperature, and that from B it is to be shown as decreasing; the pin will not alter its height until the temperature has decreased half a degree, and will therefore in the mean time describe a horizontal straight line, B C. Afterwards it will describe a descending branch, C D, whose points are all half a degree too high. Suppose, now, that from D the temperature is to be shown as increasing; the pin will again describe a horizontal straight line, D E, until the temperature has risen half a degree, and afterwards will describe a correct branch, E F.

The following corrections are therefore to be made to the curve:—Draw the verticals, C G, D H, representing half a degree, downwards, and between G and H describe a curve equal to C D. The points, B, G, and H, E, must be joined by connecting branches, which will be described at sight, without it being possible to commit any error worth mentioning. A B G H E F is then the correct curve of temperature.

It will be advisable to cut a small groove along the rod, in order to let the air have a free admittance into the tube of the thermometer. The mercury of the latter will be prevented from evaporating by the float, which may very nearly fit the tube, and the groove in the rod may be so very narrow as to prevent impurities entering the tube.

In order to be able to take the apparatus to pieces again, it will be especially desirable to give to the piece, Q Q, the shape indicated by fig. 4, N being the aperture

Fig 4.

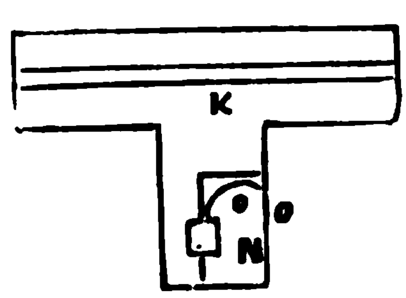
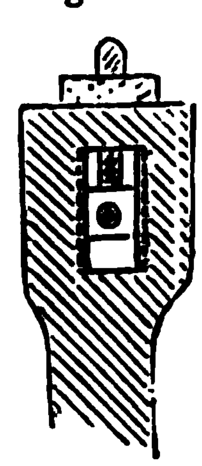



Fig. 5.



through which the rod slides, and O a hinge, by the use of which the rod and the tube may be made free. K K is the groove in which the plate, P P, slides.

In order to diminish the friction of the

[illegible]

## [illegible]

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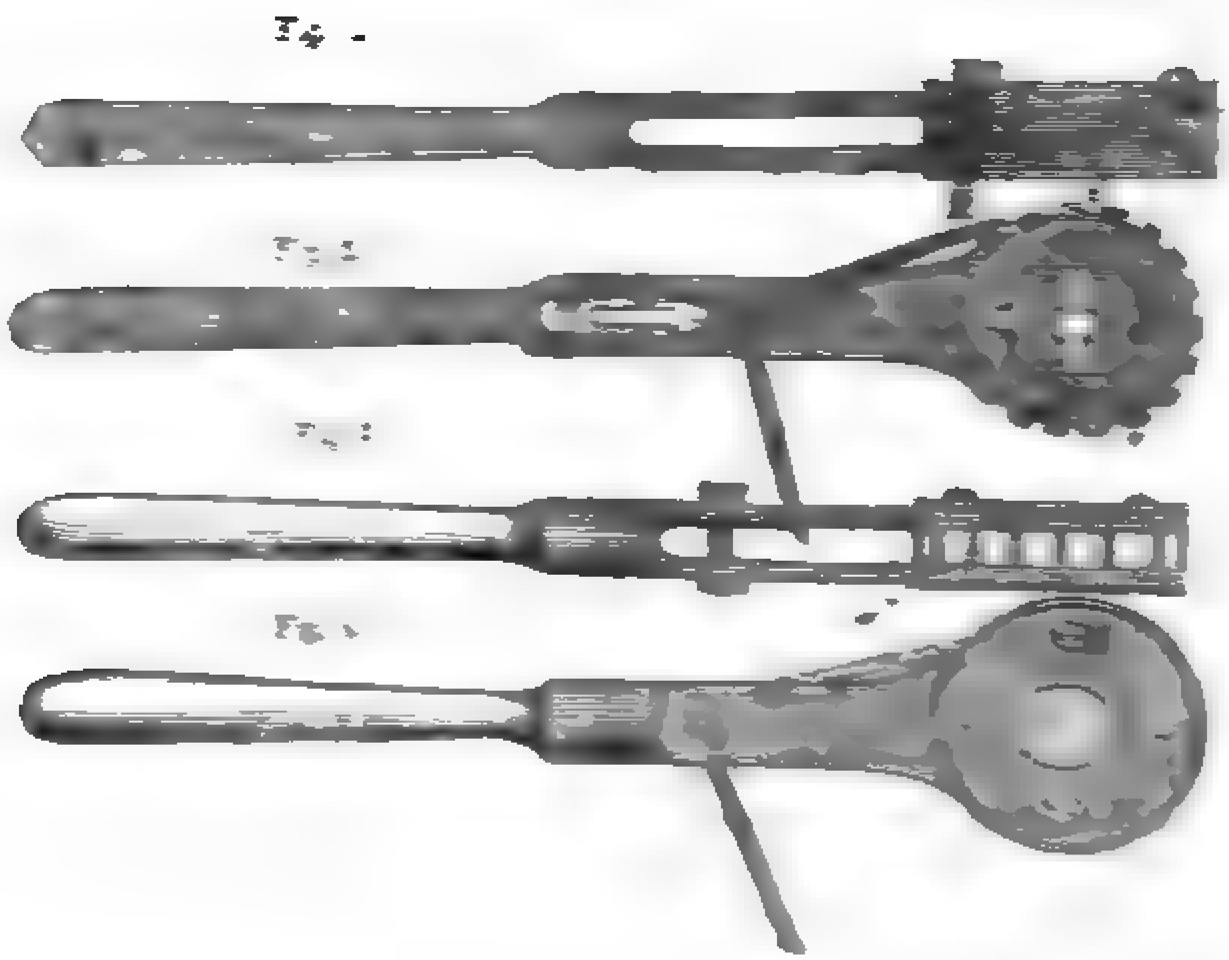

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fitting inside a double-sided circular head, two blocks of metal, the insides of which are threaded, and which, when they come together, form a circle or circular orifice. These blocks are capable of receding from or advancing towards each other, and are adjusted by means of a wedge or inclined plane, which passes through the head of the tool, and terminates at one end in a screw thread; the wedge is kept in its position, or is altered as required by means of a nut. A ratchet-wheel is formed round the head and between the two sides thereof, and is worked by means of a forked paul, which is fitted to the handle of the tool in such manner, that the paul will take into the ratchet-wheel whether turning from left to right, or *vice versâ*. When the tool is to be used as a drilling stock or as a spanner, then the blocks, instead of being circular on their inner face, must be shaped to suit the form of drill bit they are to receive, or that of the spanner which is to operate upon the nut.

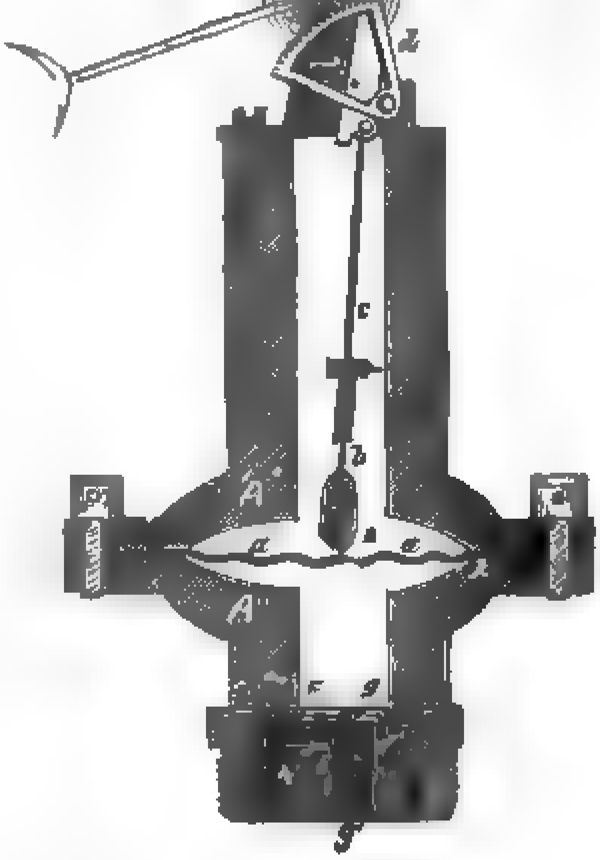
Fig. 1 of the accompanying engravings is a sectional elevation; fig. 2, a sectional plan; fig. 3, an elevation, and fig. 4, a plan of a screwing stock constructed according to this invention. A is the handle of the stock, and B is the head in which the revolving parts, C, C¹, C, are mounted. The head, B, is slotted away at the centre to admit the revolving block, C¹, and circular portions are removed from each side to receive the parts, C C. The centre slot is carried down as far as D in the handle, for the purpose of allowing the forked paul to act, as will be presently explained. E, E are two blocks, cut on their inner forces to act as screw-cutting dies, which are inserted in an oblong recess, formed through the parts, C, C¹, C, and are capable of being adjusted, so as to recede from, or advance towards each other by means of the wedge or inclined plane, F, which passes through the head of the tool, and is acted on by turning the nut, G. H, H are two side plates, which are screwed against each side of the head by the screws, I, I, passing through the parts, C, C¹, C, and J is a washer, by which the blocks, E, E, are prevented from shifting sideways in the head of the stock. K is a forked paul, which is mounted on the centre pin, L, and takes into the ratchet teeth formed on the revolving part, C¹, in the head of the stock. M is a spring inserted in a recess formed in the handle, A, and N is a button or stud, which is caused to press by the action of the spring against the forked paul, K, so as to keep either arm of the paul in action, as may be required.

The inventor also describes a screwing stock, similar to that before described, but constructed in fewer parts, and others with bent handles, for convenience in some cases.

## SCHÆFFER'S PATENT STEAM GAUGE.

The accompanying engraving represents a steam-pressure gauge, the merits of which have been spoken very highly of. A′ and A″ are two circular iron plates, between which is fastened by its outer part a steel plate, *a a*, corrugated in circles, round its centre. By means of the jointed parts, *b*, *c*, any motion with which the plate, *a a*, is affected, is transmitted to the rack and pinion, *d*, and thence to the needle or pointer.

The action of the instrument is as follows:—The steam enters through the opening, *g*, which forms a curved channel leading into the hollow, F, and presses upon *a a*, which is covered on the underside by a tin-foil covering, *k*, that serves to protect it from rust, and at the same time, to form the joint between A′ and A″. The curves of *a a*, in consequence of their elasticity, are slightly raised by this pressure, and along with them, the parts, *b*, *c*, which transmit the motion to the rack and pinion, *d*, by a




multiplication of about 400 times. On the pointer, *m*, is attached a small spiral spring, *e*, which merely serves to keep the rack and pinion, *d*, working on one side. By this arrangement the pressure which slightly moves *a a*, is registered distinctly by the pointer on the dial. The opening, *g*, is preferred to be in a curved direction, for the sake of the steam condensing in going through it, and filling the under part, F, with water, which

tends to keep the plate, *a a*, at a low temperature.

The divisions on the dial are made by actual experiment. In order to point out the advantages possessed by this instrument, it has been remarked, that "the very slight motion which the plate, *a a*, has to undergo, keeps it free from the chance of losing its elasticity; whereas, the very large multiplication makes the instrument, nevertheless, sensitive in the very highest degree, so that the slightest variation in pressure will show itself most distinctly. The simple contrivance, *b*, *c*, *d*, forming the transmission, and an entirely firm connexion between the plate and the pointer, keeps the instrument in a steady action without allowing any back-lash, or other motion of the pointer which is not caused by the actual pressure. The incasement is made so strong and solid, that no dust or any thing that might hinder the transmission in its action is allowed to enter; whereas, the plate, *a a*, itself, forms a hermetical joint preventing any thing entering beyond the hollow, F. Another consequence of the large multiplication adapted to this instrument is, that the pointer, by necessity, must return to zero after the pressure has subsided, so long as the plate has not lost its elasticity. By this means the pointer itself gives a control over the veracity of the instrument, as it is a matter of impossibility that the former could return to its starting place if the position of the plate was only to change by the breadth of a hair.

## ON THE COMBUSTION OF COAL.

*To the Editor of the Mechanics' Magazine.*

SIR,—Having shown the partizanship of Mr. Mansfield in favour of Mr. Woodcock's reinvention of my Argand furnace, I have now to examine the chemical details of his letter. In reply to his own question—What is smoke? he has gone into an elaborate enumeration of the constituents of coal and coal gas; he labours to prove that as the elements of tar are among the products of coal under distillation, and in the furnace, and as carbon, one of these elements, exists in smoke—smoke, therefore, must be a combustible, and can be burned.

After a great array of chemical data, respecting the order in which the constituents of coal are vaporizable, and are brought into combustion, he, nevertheless, neutralizes all he has said by stating, that "of the order in which these numerous hydrocarbons are evolved from the decomposing coal; or of the temperature at which they are severally generated, *next to nothing is known*"—thus telling us that next to nothing is known of what he affects to know everything.

To give one instance, out of many, of the minuteness of his details, take the following: "Whether from each molecule these numerous hydrocarbons are all formed *simultaneously*, but given off *in succession*" [how could that possibly be?] "according to their volatility; or whether each is generated and evolved separately *and successively*, leaving behind the residue of the molecule from which it proceeded, as another new compound, not yet containing the other final products of the distillation—we are not hitherto informed." No doubt of it, and the chemical world will certainly leave these knotty points—this search after nothing—to Mr. Mansfield.

He then goes on:—"We are, strange to say, still completely in the dark, both as to theory and practice, of the destructive distillation of organic substances." I would here suggest that Mr. Mansfield should speak *for himself only*, when he talks of being in the dark in these matters.

After detailing with fatiguing minuteness those processes, of which "we know next to nothing," he proceeds: "What then takes place? This is the question on which the whole inquiry about the burning of smoke depends. For the understanding of this it was necessary to dip, as above, into the natural history of tar." Just as necessary as it would be to go into the history of the Corn-laws, to enable us to know the current price of wheat.

Among the *first stages*, observe, of the process, he tells us, "The available oxygen immediately seizes the *less dense*, and coordinately more readily inflammable of its vaporous neighbours" (a theory which the highest authorities have proved to be the reverse of fact). "*First*, then, the free hydrogen and the carbonic oxide are burned" [carbonic oxide is the *very last*, if at all generated in the furnace]: "then follows the Marsh gas and the olefiant gas." Here again he inverts the order of nature. On this, the following extract from the report of Sir Robert Kane, is in point (see Appendix to the first and second editions of my Treatise on the Combustion of Coal). Having consulted him, in 1840, on certain statements made by Mr. Charles Hood, and who had fallen into the same errors, he says, "In reply to your inquiries respecting the details in Mr. Hood's paper, presented to the Institution of Civil Engineers, I have to observe that there are several inaccuracies in it. First, the light carburetted hydrogen is not among the first products of the distillation of coal, but is formed, on the contrary, only where the volatile resin-oils, and the olefiant gas, which are, in reality, the first products, are decomposed by sweeping over the ignited surface of coal, or metal of the retorts. The products of the distillation

of coal may be arranged according to the temperature at which they may be produced, as follows:

"1st stage.—Lowest temperature. Solids, as naphthaline and solid resins.

"2nd stage.—Fluids which are very volatile.

"3rd stage.—Olefiant gas.

"4th stage.—Light carburetted hydrogen gas.

"5th stage, or highest temperature.—Hydrogen gas.

"In practice, the results of two or three stages are always mixed together. Light carburetted hydrogen is more difficult to inflame than olefiant gas; Mr. Hood's paper [and Mr. Mansfield's letter] state the reverse. Davy has fully proved this."

Mr. Mansfield, then, is in error, not only as to the existence of free hydrogen in the first stage, but as to carbonic oxide, which is not evolved at all, from coal, as he supposes; but is formed from the carbonic acid, when the fuel on the bars has become clear and incandescent. This is fully explained in my treatise, in which I pointed out, for the first time, the existence and characteristics of this gas in furnaces. Sir Robert Kane observes, "When coal is burned down to a clear red fire, and though no smoke whatever is made, there may be a great amount of useful heat lost, owing to the formation of carbonic oxide." Again he says, "In your furnace alone, of all the plans I have had an opportunity of examining, the conditions of the complete combustion of *all* the constituents of the fuel are secured in the proper circumstances of quantity, time, and place. The formation of carbonic oxide, in furnaces, to which, for the first time, the attention of practical men is directed, has hitherto been a source of loss of heat to a considerable extent." Dr. Ure confirms these views, in numerous instances. On these points, then, Mr. Mansfield may very justly say *he* is "in the dark, both as to theory and practice."

After all his labour in mystifying his readers, as to the supposed order in which the gases are generated, Mr. Mansfield gives us this comfortable, though erroneous assurance, that "For our purpose, however, we may assume that, practically, all these substances—hydrogen, marsh gas, olefiant gas, benzole, totuole, cumole, cymole, naphthaline, para-naphthaline, chrysene, pyrene, &c., &c., constituting the vapour of tar—*are generated at once.*" If so, why so much waste of your space with unnecessary detail? To prove, however, his favourite hypothesis, of the gases being evolved separately and successively, we are gravely assured that "gentle carnivores do not taste picoline in their roast beef; nor frugivores, creosote in their toast." How very interesting! I must, however, confess my inability to appreciate this lively sally, or its application to the question, "What is smoke?"

It is curious to note how Mr. Mansfield labours to prove that smoke really is combustible. "Thus, the carbon," he adds, "in the form of lamp-black, not yet soot, is separated among the vapour; and further portions of marsh gas, and olefiant gas, perhaps also some other of the less volatile hydrocarbons are formed by the splitting up of, let us say, those more volatile oil vapours which would constitute coal naphtha,—namely, benzole, totuole, and cumole. The new supplies of gases of higher tenuity thus offered to the *failing oxygen* (why failing?) will be seized and burnt, consuming part of the heat (consuming the heat?) they thus generate, in decomposing a further quantity of tar vapour." To all this one can only say, in the words of the Country Justice, in one of O'Keefe's farces, "It must be true, for—*I don't understand it!*"

Again; "And now the point is reached at which combustion must cease for want of oxygen" (which want, however, is here gratuitously assumed), "what now remains? The lamp-black floats on in the current of carbonic acid and steam, mixed with the nitrogen of the air, for such is the atmosphere which leaves the fire-place soon after coaling, and passes to the chimney and the throats of men." Now, if Mr. Mansfield would but fairly examine this, his own description, he must see that it furnishes unmistakeable evidence that smoke cannot be burned; for, if it consists, as he truly states, of steam, carbonic acid, and nitrogen (all incombustible, and passing off in clouds), while the carbon is so comparatively insignificant in amount, how is this cloud of incombustibles, with its grain of mustard-seed of carbon, to be raised to the high temperature of ignition? Does not Mr. Mansfield know that the weight of carbon (numerous as its atoms may be) in a cubic foot of even black smoke, would not be equal to that of a pin's head? In fact it would be as true to say that the atmosphere itself, on a blowy, dusty day in our streets, is combustible, seeing that it contains in suspension as great a weight of combustible matter as the blackest smoke.

Mr. Mansfield at length relieves himself of the responsibility due to his fanciful theory, by frankly saying, "The reader will not, of course (why, of course?) understand me to mean that the process of the formation of soot and smoke actually takes place by steps as I have described it." But why not, seeing how dogmatically he has laid down each step of the process?

Undaunted, and determined that Mr.

Woodcock's furnace shall consume its smoke, he proceeds: "I can now point out wherein the chief merit of Mr. Woodcock's *smoke-burning* furnace consists. It lies in his supplying the vapours with very hot air," adding, "the fact is, that smoke can be burned very easily *under proper conditions;* one chief condition being, that the temperature of the smoke and the air presented *shall be high enough*"!!! Admirable! Why, if the temperature had been "high enough," there would have been no smoke to burn. This theory, then, assumes, that the carbon of the gas having been first reduced in temperature, and converted into the black element of smoke, may, if the temperature be high enough, be burned. No doubt of it; if the temperature *were high enough*, it could be burned. Grant Mr. Mansfield, then, this one "chief condition," and he will undertake the combustion of smoke. So reasons the school-boy, and with equal truth,—Let the sky but fall, and we shall catch larks.

Mr. Mansfield, however, may now cease from his labours, and give up Mr. Woodcock and his furnace, this gentleman having fairly cut both him and his theory; and here we have the first ray of returning common sense. In your Number of the 28th October you gave a drawing and description of "*Woodcock's smoke - consuming furnace;*" you subsequently gave Mr. Woodcock's own letter "on the formation and combustion of smoke;" showing that "cold air does not cause the combustion of *every particle* of smoke," which, he alleges, hot air would. But the tables are turned. Now look to the supplements of the *Times*, and there we find daily advertised as follows: — Smoke combustion? — no, — "Smoke prevention. Woodcock's patents are the only plans which prevent all smoke." This, then, is the unkindest cut of all; for if, by his plan, smoke is prevented forming, there cannot be any for Mr. Mansfield to work on, and his occupation then is gone! Thus, then, let us give credit to Mr. Woodcock for dissipating at once all the theories of the smoke-burners, Mansfield's included.

Mr. Mansfield concludes by stating what certainly was not necessary. "I have not," he says, "met in print with the *notions*" (capital term!) "I have here thrown together as to the theory of smoke." He might add, nor any one else. Mr. Mansfield, then, has the credit of being a chemical analyst *sui generis*, and has established his claim as an original-smokeburner.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, Dec. 16, 1854.

## SMOKE COMBUSTION.

*To the Editor of the Mechanics' Magazine.*

"Non fumum ex fulgore, sed ex fumo dare lucem."—Hor. De Arte Poeticâ.

Sir,—Courtesy to you and my public arbiters, and a desire for truth, induce me to break my self-imposed silence—the resolution of well-satisfied success.

First, then, to the assault of the Liverpool League, with its Cerberus-headed chorus, well concerted. Mr. Mushet will find his required data in the forthcoming report of the two *séances* at the Institute of Civil Engineers, when my inventions were most thoroughly explained and canvassed. To anticipate that report would involve repetition.

I gladly accept his admission that he had misunderstood the place of the air tubes, and his consequent qualification of his remarks on the heat of the air passing through them. This was not his only misapprehension; he has equally misapprehended the bases of my invention.

"Engineer" states nothing in his letters for remark. Now, therefore, to Mr. Williams' fulminations. His vehemence and his virulence produce the suspicion of inherent weakness in his position, and a desire to divert from a calm inquiry. Abuse is no argument; it proves only the writer's want of courtesy and temper and the weakness of his cause. The entire inapplicability of his epithets to me, which I will not degrade my pen or your paper by repeating, really leaves me perfectly unhurt by them in fame or feeling. True philosophy is tolerant of fellow-workers, and, sinking personal feeling, seeks only truth, from whatever source evolved. Wanting this essential, Mr. Williams seems a jealous magnate, who

"Can bear no rival near his throne,"

and who

"If success his steps attend,
Discerns a rival in a friend,
And hates him for encroaching."

Is it not surprising that Mr. Williams was once a profit-seeking patentee, and is an author defiled by the mercenary contact of copyright? Yet so it is. When his patent expires, with the savage impotence of a toothless lion, or less noble beast, he would resist any other improvement, and destroy what he cannot enjoy.

His book can still profit him; for its puffs are not wanting in his letters. The repeated references to it are, of course, purely *pro bono publico.* Has he the copyright, too, in the article in Dr. Ure's Dictionary?

On his patent expiring at the end of 14 years, he was either well requited by the exclusive profits of that period, or, if not, and the invention were of great public utility,

was entitled to apply for an extension of the term. If he did the latter and failed, where was the utility? If he did not, because already remunerated, where the immaculate lucre-hating disinterestedness he so pointedly assumes? Why so fierce towards all other patentees? The Smoke Act does not violate the great jurisprudential maxim, "Lex non cogit ad impossibilia," in requiring the consumption of smoke, as I will presently show. Mr. Williams at one time deprecates, and at another desires, the enforcement of the Act. Its fault is that its preamble did not recognise Mr. Williams's achievements, and its enactments create him dictator at this great smoke crisis. Yet, unfortunately, Mr. Williams's merits seem unknown to ministers and legislators, magistrates and inspectors, in whose good company I am so soundly rated. His patent has only secured a posthumous fame in his own self-laudatory work, which came to the death-bed of its dying parent to rescue it from the impending oblivion. Though Mr. Williams has worked and written for years, smoke had hardly diminished, an Act was necessary, and even Mr. Williams thought prudent to try the inventions of others, to wit, Mr. Prideaux's. If already perfect, why dissatisfied, and still experimenting? Mr. Williams does not refer confidently to numerous London furnaces for triumphant proof of his success. I can do so as to mine. He confines himself to provincial or Irish places. If so pre-eminently successful, how is this? Being curious to know, I have, within the last few days, devoted some time to seeking for some furnace on his plan in the Metropolis. So obscure is its reputation, that I only with great difficulty discovered any. I at last found two; the leaders on his own agent's list (I give you, Mr. Editor, the names of them). What is their result? In the first of these such a frightful mass of cold air was thrown in immediately over the door, through a perforated plate of double the size of the door, and admitted to the furnace immediately under the boiler through about three-quarter inch holes, that I at once remarked to the stoker, "Surely you can't make much steam here?" The man replied, "No, sir, unless I close the apparatus." The answer to inquiries in both cases was, "We just avoid informations against the furnace as a nuisance, but consume more coal and time on our works than we used to do." In each case I had coal thrown upon the fire, and for many minutes afterwards a dense mass of something was pouring from the shaft. Politeness must forbid my calling it smoke, or Mr. Williams's veracity would be impugned, but at any rate it was a very opaque cloud, traceable for nearly 100 yards from the shaft's mouth, and this, Sir, is Mr. Williams's success. I would say to him, "Tace vel face." I must add, that in one of these cases Mr. Williams had at one time condescended to use heated air from the ash-pit, though positively repudiating that source in the specification of his late patent. He charged, too, for this contrivance as patented! The admission of air was regulated by clock-work. The whole apparatus was soon removed as complicated and inefficient. They are complete *failures*. Modesty of style is a near relative of merit and success. The absence of that modesty in Mr. Williams's letters, as usual, is a true symptom of their absence.

Now, smoke prevention is not an exact science, and I must repeat that tests are better than theories. In self-defence, I state that, having been invited by most influential furnace-owners, I have, after fitting up one furnace for them, been soon requested to fit up another. My furnaces, having attracted very numerous critics of all classes, have been uniformly commended and proclaimed perfectly successful. Are not these grounds for confidence or obvious proofs of a sound and simple system? I submit they are.

Whether Mr. Williams plagiarized from any of his predecessors, I cannot say, though I have my suspicions. This I know, and can most truthfully declare, that, as a furnace owner, invention being born of necessity with me, as most others, and being fond of mechanics and chemistry, and quite untaught, untrammelled, and undarkened by the theories of smoke authors,—unblessed, too, by a knowledge of Mr. Williams's panacea,—I set heartily to work, with the aid of my engineer and a labourer, to pull my furnace to pieces, and try experiments to avoid smoke, and after much hard work and hard thought had succeeded; when my counsel, having settled my provisional specification, remarked, "There is a Mr. Williams, who claims every invention of this kind, be it what it may. Do you know what he has done?" This, I can prove, was on the 12th of August last. Mr. Williams' work was not published until some days later, for I applied at Weale's for it. He said it was not published. On the day of its publication, I bought and read it; my first reading upon smoke, and first hint of his theories.

Mr. Mansfield's evident verbal error as to smoke being suspended in the gases is first admitted by Mr. Williams, but afterwards uncandidly used by him as an excuse for introducing a poverty-stricken Paddyism.

As to the charge of uncertainty, occasional inapplicability, and doubtful result, brought against my inventions, and my concealment of their numerous failures, I can

only say, my experience does not furnish a single instance of their failure.

The mistaken partnership with Mr. Williams is quite as abhorrent to my feeling as to his.

Mr. Prideaux's and my plans are not identical. I do not inconsistently advocate the application of hot and cold air for the same purpose. I must repeat, cold air is good to the fire-bars, and hot air to the gases of the furnace. Mr. Williams says he has Mr. Prideaux's plan at work; and if he knows (though this is doubtful) anything of my plan, he must be aware that the two plans are widely different. Mr. Prideaux keeps the door cool; I keep the ash-pit cool, and each plan attains its object. I allow the air to enter the fire-bars as cool as when passing through the ash-pit; for this purpose keeping the two rows of angular bars as near the fire-bars as possible, the upper row absorbing considerable radiated heat, but never becoming red-hot, the lower row is but slightly heated; and as there are oblique spaces of nearly two inches width between each two bars, it is evident that not much of the heat of the bars can be taken up by the air in its rapid passage. On a cool morning, I tested this at Messrs. Meux's, with a thermometer, protected from radiated heat, and found that the air entered the fire-bars at a temperature of 42° Fahr. Mr. Prideaux's two rows of angular plates, placed before the door, almost touch; and thus the air is driven between them in very thin films, and necessarily partakes of their heat, and is again driven through a third series of parallel plates, exposed to the full action of the fire, and red-hot, also being nearly in contact, and thus the air is inevitably heated. This last apparatus, *essentially* the *heating one*, I do not use.

And now to the kernel of the question. *Can smoke be burned, or can it not?* I fearlessly reply, Yes! and most advantageously. It makes extra fuel. First, parliamentary smoke—or smoke as popularly understood. This is what a furnace fire, covered with small coal, smothering all its flame, emits. But Mr. Williams, anxious to ignore the emission of smoke from his shaft, pleasantly calls it *gas*. So, and so only, can Mr. Williams say, "My furnace makes no smoke." The league admits this to be a combustible substance. There is also another substance. Let us call it "TRUE SMOKE." Mr. Williams says this is the result of imperfect flame, and consists for the most part of steam, carbonic acid, and nitrogen, and minute portions of carbon in suspension. It is admitted that the two gases are incombustible, and that without the combustion of one of them at least, the carbon must be retained, and some given off. This, as I understand it, is your correspondent's case, and it is of undoubted truth, and here they would conceive there is an end of the argument. But not so. Before concluding, we must go further. It is well known that if carbonic acid is made to impinge upon incandescent coke or carbon, that it will at once yield a portion of its oxygen, and be converted into carbonic oxide, which is a combustible gas; and, if a supply of oxygen is then given to this gas at such a heat as not to reduce it below its flame point, that then the carbonic oxide, with the floating particles of carbon, will be converted into flame, to be once more reconverted into carbonic acid.* But in the furnace this last conversion takes place at a point in the flues beyond the seat of primary combustion, and where no foreign carbon is left to discolour the gases. Thus no smoke is evolved, and the "true smoke" is as much burned as wood or coal can be burned. This my furnace uniformly accomplishes. *My points are*, to encircle the gases completely as they leave the furnace with heated atmospheric air, which I prefer to administer in thin films or through very small orifices, thus perfectly, and not partially, applying the Argand principle — to protect thoroughly the bottom of the boiler or copper from the direct action of the flame at the point of mixture of the air and gases, and where the heat is excessive—to make the supply of heated air to the gases entirely self-regulating, without valve or complication—to convert the carbonic acid gas, generated in the furnace, into carbonic oxide, and thus to burn the smoke, and to supply the fuel on the fire-bars with cool air, and by this means to insure a more perfect primary combustion.

I believe that I have succeeded in each of these points, and that they have never before been so perfectly accomplished.

I regret that the argument compels me to be egotistical, and in the comparison of conflicting claims to be personal.

I am, Sir, yours, &c.,
WILLIAM WOODCOCK.

Earl's Court, Dec. 20, 1854.

## ON THE ROTATION OF THE MOON.

*To the Editor of the Mechanics' Magazine.*

SIR,—Permit me one word on "Dejere's" "Geometrical Conception" of an axis. His remarks on St. Paul's, Nelson, and the populace (query, is *this last immovable?*) are rather odd; we are questioning, not the

* Mr. Williams states that soot, when heated to 600 degrees Fahr., becomes carbonic acid. How, then, does Mr. Wright err in saying it may be burned?

motion of the *earth*, but of the *moon*. However, we may be sure he is within his depth, and can give us the equations of all their curves, and of the conic sections of Arctic and Antarctic zones; nor do I venture to disturb his belief in his own superiority as an astronomer, &c., &c. But as he is pleased to term me an engineer, and expresses "little doubt" that I think an axis means an *axle*, I beg to define my "conception" thereon. I need not refer a mathematician to the mathematical definitions of a point and line, but proceed at once *in medias res*, to state that an axis is a line passing or assumed to pass, through one or more fixed points in a body, around which point or points every other point of the body moves or rotates. When there is a vibratory axis (like the *axle* of the disc engine), there is only one fixed point; but we need now only consider a fixed axis of rotation. The existence of such an axis in the earth and its non-existence in the moon, is so clearly defined by the correspondent you quote, that I can add nothing to it in a rational or a material sense. But to meet the inability, which "Dejere" asserts, of practical and theoretical men to understand each other's language, I will venture to give the difference a mathematical explication. When there is a true rotation on an axis, as in the case of the earth, we have the two motions as designated, of "translation" and of "rotation." When there is no rotation, as in the moon, we have the motion of translation only. I do not know how mathematicians split up one motion into two. I am aware that they do many things upon a sheet of paper, which can be done no where else, and, as "Dejere" alleges, they may find it convenient to do so; but I can be no party to a "convention" for splitting up the sole motion of the moon into two, or the two motions of the earth into three or more. *We must adhere to the existing facts*, and "Dejere," as a mathematician will then perceive that every point taken in the earth describes by the two united motions a cycloidal curve in the orbit, and every point in the moon (sinking the elliptical assumption) a pure circle. Now, is there any "mathematical convention" which identifies a circle with a cycloid, or assigns them the same equation? The nearest and most remote points of the circumference of the moon describe two concentric circles in the orbit, between which the moon moves on, like the right and left wheels of a carriage on a railway curve, defying rotation. It is a "geometrical *misconception*" to assume its possibility, and equally so to assume that the moon is not a "material object." It cannot be "confounded" with anything but matter. Engineers may, as "Dejere" supposes, believe that Arctic discovery will reveal an *axle* sticking out of the earth at the North Pole; I must leave them to answer this. But as in his last paragraph he admits the truth of my assertion, that the alleged motion of the moon, as a *material object*, is impossible, it devolves on him to prove, how the lesser light which God made to rule the night has become immaterial. And likewise, from the astronomical lore upon his shelves, he will kindly point out the writers who have calculated and described the motion of the moon as differing essentially from the motion of the earth, and which of them has explained the great discrepancy of these two motions when referred to the general *theory, taught* in astronomy, of the orbitual planetary progressions being due to a force which *projected these bodies into space.*

Meanwhile, if "Dejere" reads Mr. Hopkins' book, he may discover with surprise who it is that has "tumbled awkwardly" into astronomical matters, and other matters, and to whom the "accident" has befallen which "is a caution and admonition to us all." There are clearly more things in heaven and earth than "Dejere" has dreamed of in his philosophy.

I am, Sir, yours, &c.,

DAVID MUSHET.

December 19, 1854.

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*To the Editor of the Mechanics' Magazine.*

SIR,—Will you kindly allow me to correct an error into which "Tyro" fell in his letter on page 564, and which escaped my observation until to-day. In making the correction I must refer to his diagram on the above page, and request your readers to suppose a line $d\,e$, drawn across the moon, in her second position, at right angles to $a\ b$, through her centre. Then the closing clause of "Tyro's" paragraph at the bottom of column 1 (page before named), should read thus:—"and this would obviously enclose a portion of the moon's surface, $e$ N," (and not, $A^1$ N, as Tyro has it), "which was not visible in the former situation."

I do not wish to attach any great importance to the error, as it is one which an experienced astronomer might *inadvertently* make, and therefore may well be excused in a "Tyro."

I am, Sir, yours, &c.,

DEJERE.

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## A PERPETUAL THERMOMETER.

*To the Editor of the Mechanics' Magazine.*

SIR,—The suggestions offered in your last Number by Mr. Recordon, of Cambridge,

in relation to a registering thermometer have been anticipated several years ago, and successfully carried into effect by machinery more suitable than that which he proposes.

At the meeting of the British Association, at Cambridge in 1843, or 1845 (I forget the exact year), Professor Airey gave a lecture on magnetic instruments, and explained the expensive and operose methods of registering their various motions. The idea occurred to me that by using a fixed light, mirrors, and photographic paper, we might cause the deflections of the needles to be registered perpetually. I communicated the idea immediately to Lord Rosse, but thought no more about it. In the Exhibition of 1851, however, there were shown several instruments in which this mode of registering was applied with perfect success. They are in constant use, I believe, in the Kew observatory, and among those exhibited as above-mentioned, there was a registering thermometer (an instrument which had not occurred to me as suitable) constructed by causing a piece of photographic paper to pass behind the tube of an ordinary thermometer, while a bright light (without heat) shines through the tube, and is cut off only by the mercury therein. The curve resulting from variations of temperature acting upon this instrument, is exactly what is wanted by Mr. Recordon, and I do not think a more simple method for obtaining it could be desired.

Yours, &c.,

J. M.

Temple, December 18, 1854.

## UNSAFE PASSENGER SHIPS.

### THE SHIP-SINKING SYSTEM.

*To the Editor of the Mechanics' Magazine.*

Sir,—The extract from the *Melbourne Argus* in your last Number is suggestive of many painful reminiscences in the history of our mercantile marine.

In this matter we are truly "a nation of shopkeepers," of a penny wise and pound foolish description—looking after the pennies with the greed of extreme avarice. I hope no stronger proof of this dreadful state of things can be found, than is afforded by the mercenary spirit which enters so largely into all the details of the equipment of merchant ships.

I have, on several occasions, waited upon persons connected with shipping, for the purpose of inviting their attention to various important and highly useful inventions, calculated to increase the efficiency, or largely to administer to the safety of vessels at sea. The first question asked me has almost invariably been, "Will the improved apparatus come *cheaper* than those at present in use?" The answer is, necessarily, in most cases, "*No;* but it will be much more advantageous in use, save labour, and in the long run prove highly economical." "Ah, well, the addition of 5 per cent. to the cost will be prohibitory; no one will buy them!"

No matter how great the superiority of the anchor; how strong the cable, how efficient the pump, or windlass, or how trustworthy the compass; if a *cheaper* article is to be had, that will, in nine cases out of ten, command a preference. The disastrous consequences of making every "case of life or death," a breeches-pocket question, led to the necessity of government interference in the case of emigrant ships; but even this surveillance has, in many cases, been found inadequate to ensure more than a *semblance* of "providing for a rainy day."

Notwithstanding the vigilance of the emigration agents, vessels have not unfrequently been certified as conformable to the "Regulations," which have been, after all, ill found, short handed, and fully provided with "necessaries," a large portion of which have been "dummies."

In the hour of danger the crew has been found unskilful, the anchors defective, the cables too weak, the fire-engines useless, the boats inadequate in dimensions, and unprovided with any apparatus for lowering them in safety, and unfitted with the plugs necessary to keep them afloat! And then, in the wake of all this false economy, comes the temptation of our villanous "ship-sinking system of insurance," tending to foster and encourage, rather than to check the original evil.

It is true, that this otherwise gloomy picture has a few bright and shining exceptions, on the part of a few (would they were more) spirited ship-owners, whose well-found and well-manned clippers fly with lightning speed in safety over the pathless ocean; obtaining for them a well-deserved and world-wide celebrity, as well as an adequate return for the liberality and judgment which has regulated their arrangements.

I remain, Sir, yours respectfully,

Wm. Baddeley.

18, Angell-terrace, Islington, Dec. 11, 1854.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

Atlee, Thomas William, and George Jobson Atlee, of Birmingham, Warwick, factors and manufacturers. *Improvements in printed or other forms, applicable for bankers' cheques, orders for goods, wharfingers' and carriers' receipts, taxes and rates collectors' receipts, and various other parochial,*

*commercial, or private purposes, whether such forms be bound up into books or not.* Patent dated May 23, 1854. (No. 1143.)

*Claim.*—The perforating of printed or other forms when a part or parts of such form is to be torn off, and the other part or parts to remain as a cheque or cheques, or evidence or evidences of the business or other transaction in which such form may be used.

JENKS, FREDERICK, of Handsworth, Stafford, manufacturer, and THOMAS BROWN, of Birmingham, Warwick, manufacturer. *An improvement or improvements in saddle-trees.* Patent dated May 23, 1854. (No. 1144.)

*Claim.*—The manufacture of saddle-trees of papier maché.

BIGGS, JOHN, civil engineer, of Ightham, Kent. *An improvement in the mariners' and other compasses, by isolating and rendering them insensible to the disturbing influence of local attraction of iron, steel, and other bodies.* Patent dated May 23, 1854. (No. 1145.)

This invention consists in the arrangement of two or more concentric rings of magnets, placed within the compass-box, for the purpose of isolating the needle or needles, and rendering them insensible to the influence of local attraction in the mariners' and other compasses.

WHITE, WILLIAM, of the firm of White and Son, of Cheapside, London, hat manufacturers. *Improvements in hats, and in hat-blocks.* Patent dated May 23, 1854. (No. 1146.)

This invention consists in the construction of hats with an internal perforated, grooved, or indented surface, by means of a grooved hat-block, or by affixing to the inner side of a hat, made in the ordinary manner, an indented perforated piece, &c.

DUFOUR, LOUIS EMILE, merchant, of Paris, France. *Improvements in breech-loading fire-arms.* Patent dated May 23, 1854. (No. 1147.)

This invention mainly consists in substituting an incline on the holding-tongue of Lefaucheux's guns, for the oblique traversing-pin used for allowing the barrels to oscillate vertically.

MADIGON, ERNST, and RAIMOND GABRIEL DE GRIMOUVILLE, both of Paris, France. *Certain improvements in glasses, shades, and smoke-plates, used in gas and other lighting.* Patent dated May 23, 1854. (No. 1148.)

The inventors slit the above articles longitudinally, or in any other suitable direction, so as to allow for the expansion and contraction to which vitreous matter is subject upon heating and cooling, and thus prevent their breaking.

KUCZYNSKI, JOSEPH, of Rue de Rivoli, Paris, France. *Improvements in preparing baryta and its salts.* Patent dated May 23, 1854. (No. 1149.)

*Claim.* — Mixing chloride of sodium or other suitable salt with sulphate of baryta and charcoal, so as to obtain a fusible compound.

LAWSON, JOHN, of Sidmouth-street, Gray's-inn-road. *Improvements in the manufacture of cut pile fabrics.* Patent dated May 23, 1854. (No. 1152.)

This invention consists in attaching successive rows of suitable lengths of yarns to a fabric, by the aid of a sewing-machine, so as to obtain a pile on the surface of it.

CLARENDON, THOMAS, of Dublin, gentleman, and OWEN JOHN GILSEN, of the same city, carpenter. *Improvements in the means or apparatus for working breaks on railway-carriages.* Patent dated May 24, 1854. (No. 1159.)

This invention consists in the adaptation and application of plate springs or other suitable elastic couplings between the break-blocks and the levers, by which they are thrust against the wheels; in an arrangement for causing a bell to ring in the guard's box, whenever the breaks are put on or withdrawn; and in putting on the breaks of the carriages, by means of the buffers of those in front of them.

BALL, THOMAS, of Nottingham. *An improvement in manufacturing ornamented looped fabrics.* Patent dated May 24, 1854. (No. 1160.)

This invention consists in printing with one or more colours the pile surfaces of piled looped-made fabrics after they have been produced in warp or knitting machines.

JENNINGS, JOSIAH GEORGE, of Great Charlotte-street, Blackfriars, and ROBERT DAVONPORT, of Jonathan-street, Vauxhall. *Improvements in the construction of kilns for burning pottery and other ware.* Patent dated May 24, 1854. (No. 1161.)

In this invention the products of combustion pass from the fires to the backs of the fire-places or kilns, where they meet with numerous streams of heated air from the front and side faces of a perforated chamber, and there are other air passages built in the kiln communicating with the open atmosphere, so as to heat the passing streams of air, which also are divided into numerous small jets.

HARRISON, JOSEPH, of Fitzroy-square, Middlesex. *Improvements in pianofortes.* Patent dated May 25, 1854. (No 1164.)

These improvements consist in substituting for the ordinary wooden rest-plank a metallic one, secured upon the upper end of each of the wooden bracings, which form the back or framing of the piano; and, in place of the ordinary hitch-pin block, attaching upon

the lower end of the said bracing, a plate or metallic clipper-shoe plate, provided with end bearings for the metallic rest-plank.

EVERALL, EDWARD, of Henrietta-street, Brunswick-square, Middlesex, gentleman, and THOMAS JONES, of the same place, chemist. *Waterproofing all kinds of cloth, clothing, silk, and leather, without injury to their respiratory properties, flexibility of fabric, colour, or appearance.* Patent dated May 25, 1854. (No. 1165.)

The inventor describes a solution composed of sulphate of alumina and potash 7½ lbs., dissolved in three gallons of water, oxide or acetate of lead 3¾ lbs., nitrate of lead 5 oz., dissolved together in seven quarts of water, and soluble silicate of potash 5 oz., dissolved in one quart of water; the three solutions being mixed together, a white precipitate is then deposited; the mixture remaining undisturbed, the clear liquor is afterwards drawn off and used as a waterproofing substance.

MANTRAND, EDOUARD CARI, of Paris, France, chemist. *Improvements in the manufacture of phosphorus.* Patent dated May 25, 1854. (No. 1166.)

*Claim.*—Obtaining phosphorus by decomposing matters containing phosphates, and more particularly phosphates of lime, by thoroughly mixing with them a suitable quantity of carbonaceous matters alone, or mixed with a suitable quantity of silicious matters, and afterwards passing in suitable apparatuses hydrochloric acid gas or chlorine through these mixtures, when the same are brought to a bright red or white heat.

DOYERE, LOUIS MICHEL FRANCOIS, of Paris, France, professor of natural history. *Improvements in purifying grains.* Patent dated May 25, 1854. (No. 1167.)

By the contrivance of the inventor, the grain and heterogeneous matters are separated by being projected simultaneously, and falling at various distances, according to their specific gravity.

JEAKES, JOHN WILLIAM, of Great Russell-street, Middlesex, engineer. *An improved construction of stove-grate.* Patent dated May 25, 1854. (No. 1168.)

*Claim.*—The application to stove-grates, the bottom of the fire-place or fuel chamber of which is stationary, of a sliding curtain and fire bars for regulating the indraft of air to the burning fuel, and exposing fresh fuel as the upper stratum becomes consumed.

PACKHAM, JOHN, of Western-road, Brighton. *Improvements in boilers used for heating and circulating water.* Patent dated May 25, 1854. (No. 1169.)

The two ends of the inventor's boiler are water-spaces, and connected by pipes, enclosing the fire-place, which is got at through an opening in the front. The upper part of the boiler above the pipes is hollow, and constitutes a water-space, which opens into the ends. The flow-pipes are fixed to the upper part, and the return-pipes are connected with the ends near the lower part. The fire-bars may be either solid or hollow, and connect the two ends. Through the upper part of the boiler there is formed a tubular opening, which descends down into the fire furnace, and rises sufficiently above the top of the boiler to contain a considerable supply of fuel, which will descend when that which is below is consumed, the upper or charging end being kept closed. The boiler is set in brick-work, in such manner that a flue is made in the latter on either side near the upper part of the fire-place, and in a direction from back to front; the flues then rise and pass back over the top of the boiler to the chimney, which is at the back end of the boiler.

LIVINGSTON, ALLAN, junior, of Portobello, Midlothian, Scotland, brick-manufacturer. *Improvements in earthenware for drains and sewers.* Patent dated May 26, 1854. (No. 1171.)

*Claims.*—Constructing earthenware pipes for such purposes with an aperture formed in each length of pipe, in such a manner as to afford access to the interior thereof on the removal of the cover which overlays it.

CHILSON, GARDNER, of Boston, Massachusetts, United States of America. *A new or improved furnace or heat-generator and radiator, to be used for warming buildings or apartments, or for various other useful purposes.* Patent dated May 25, 1854. (No. 1173.)

This invention mainly consists in the employment as a fire-pot or chamber of one or more cones, or tapering tubes without descending bends or flexures, and having their eduction openings made to carry off the non-combustible volatile products, and to retain nearly, if not all, the volatile combustible products while the external surface or surfaces of such tube or tubes are allowed to radiate heat freely.

SWEETSER, SAMUEL, of Massachusetts, United States of America. *An improvement in preparing skins or hides for the application of tannin thereto, or for being tanned.* (A communication.) Patent dated May 26, 1854. (No. 1174.)

The inventor says, "by using soda-ash in combination with lime, thereby producing a compound alkaline solution, I have found that there appears to be a specific action upon skins, such as swells or fulls them to such an extent as to render the milling and beaming processes generally required previous to their immersion in a

solution of lime almost if not wholly unnecessary."

LOOMIS, MAHLON, of Massachusetts, United States of America. *An improvement in the manufacture of artificial teeth.* Patent dated May 26, 1854. (No. 1175.)

This improvement consists in making sets or parts of sets of artificial teeth entirely of porcelain.

LORD, JAMES, of Farnworth, Lancaster, manager. *Improvements in the manufacture of articles of ladies' under-clothing.* Patent dated May 26, 1854. (No. 1177.)

This invention consists in producing Vandyke or scolloped edges, by causing the warp to fail to engage with the weft in some places,—in forming in materials for petticoats, open parts, or pipings, and strips of fustian, — and in indicating the shape of chemises as on the materials to be used for forming them, by weaving or printing.

SCHMOOCK, JULIUS, of Oxford-street, Middlesex, carpenter. *Improvements in the construction of children's and other carriages moved by manual power.* Patent dated May 27, 1854. (No. 1179.)

This invention consists in constructing such carriages with a lever-handle placed at the back, capable of vibrating, and connected to the fore axle-tree by means of cords, rods, &c., in such manner that the depression of the handle causes the fore axle-tree and wheels to be turned, so as to steer or direct the carriage.

HIPKISS, JOSEPH, of Dudley Port, Stafford, ironmaster. *An improvement or improvements in puddling-furnaces used in the manufacture of iron.* Patent dated May 27, 1854. (No. 1180.)

*Claim.*—Making and repairing the beds of puddling furnaces with the cinder produced in the manufacture of iron, either alone, or fused, or mixed with pottery, or with other iron ore.

MURDOCH, JAMES, of Staple-inn, Middlesex. *Improvements in toy pistols.* (A communication.) Patent dated May 29, 1854. (No. 1181.)

This invention consists in certain arrangements in the construction of toy pistols, whereby they may be discharged by one hand as ordinary pistols are, and also in the application of percussion caps to such pistols.

STENSON, WILLIAM, jun., of Whitwick Collieries, near Ashby-de-la-Zouch, Leicestershire, mining engineer. *Improvements in steam-engine valves.* Patent dated May 27, 1854. (No. 1182.)

In carrying out this invention, the object of which is to reduce the friction of valves, a cylindrical box, having within it a projecting concentric ring, is fixed to the cylinder, and above the ring packing is introduced, to keep the upper part of the valve steam tight. A cylindrical valve is introduced into the box, and is kept up to its seat by a screw; and in the seat of the valve, at the inner end of the box, there are three openings, two leading to the steam passages, and one to the eduction passage. The inner end of the valve is formed with two recesses, one large enough to cover one of the induction and the eduction openings in the seat, and the other being used to let steam into the induction passage to which it is opposite.

BAZLEY, THOMAS, of Manchester, Lancaster, cotton spinner. *Improvements in and applicable to furnaces and vessels used in connection therewith for the manufacture of glass.* Patent dated May 29, 1854. (No. 1184.)

This invention consists—1. In forming an improved melting pot. 2. Of an arrangement in which the fires are placed on one side of the furnace, and the flue orifices on the opposite, these orifices being on, or a little below, the level of the bottom of the furnace. 3. In applying heated air in a certain manner to promote combustion.

KRAUT, HENRY, of Zurich, Switzerland, engineer. *Certain apparatus applicable to cocks, taps, and valves.* Patent dated May 29, 1854. (No. 1185.)

This invention consists in the application of a tube of prepared India-rubber to apparatus for opening and closing taps, cocks, valves, &c., this tube acting as stuffing-box, spring, and valve, or as stuffing-box and spring only, or as stuffing-box only, when applied to piston rods of pumps, &c.

EVANS, JOHN, of Abbots Langley, Hertford, paper manufacturer. *Improvements in the manufacture of ornamental paper and paper bands.* Patent dated May 29, 1854. (No. 1186.)

*Claims.*—1. The manufacture of ornamental paper, containing within its substance lace or other open textile fabrics, introduced at the time of its formation from the pulp. 2. Manufacturing ornamental paper by subjecting coloured or enamelled paper to pressure between metallic surfaces while in contact with lace or other ornamental textile fabric. 3. The application to the manufacture of bands of the paper above described.

NORTHEN, WILLIAM, of Vauxhall-walk, Lambeth, Surrey, potter. *Improvements in the manufacture of mangers and troughs for stables.* Patent dated May 29, 1854. (No. 1189.)

*Claim.*—The manufacture of mangers and their water-troughs, and basins, of earthenware.

SABLONS, ANDRIEU ERNEST, of South-street, Finsbury, London, civil engineer.

*Certain improvements in the construction of trunks, travelling-boxes, portmanteaus, and other similar receptacles.* Patent dated May 29, 1854. (No. 1190.)

The inventor forms a portmanteau of such a form that it may be used, when required, as a chest of drawers, or other piece of furniture.

RIDSDALE, JOSEPH, of the Minories, London, brass-founder. *Improved means or methods of communicating between different parts of ships and other vessels.* Patent dated May 30, 1854. (No. 1191.)

This invention consists in signalling, "by means of a lamp or lamps, or a disc or discs, or an arm or arms, or any other suitable telegraphic signal!"

TOMLINSON, RICHARD, of Sale, Chester, commercial traveller. *The application of a new material or fabric to the manufacture of plasters for medical or surgical purposes.* Patent dated May 30, 1854. (No. 1193.)

*Claim.*—"The substitution for leather and plain woven cloth of a woven fabric, coated on one side with waterproofing composition, so as to form a back for the plasters, spread on the other side in such manner as to leave a margin round each plaster."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in machinery for making bags of paper or other suitable material.* (A communication.) Patent dated May 30, 1854. (No. 1194.)

This invention consists in an arrangement of shears for cutting the paper or material to the required form; in certain means of conveying the paper, after it is cut and folded, to the apparatus by which it is to be pasted and formed into a bag, &c., &c.

DOULTON, HENRY, of High-street, Lambeth. *An improvement in the manufacture of junctions for sewers and drains.* Patent dated May 30, 1854. (No. 1196.)

The object of this invention is to manufacture junctions of clay or brick earth, suitable for bonding in with bricks in constructing brick sewers, each junction being formed with a socket suitable for the end of the pipe it is to receive.

SCOTT, MICHAEL, of Great George-street, Westminster, civil engineer. *Improvements in joining or connecting pipes.* Patent dated May 30, 1854. (No. 1197.)

This invention mainly consists in forming broad junction flanges which come together, and are bolted round the outer parts only, so that when expansion or contraction takes place there may be sufficient elasticity in the broad flanges to allow it to act without injuring the joints.

## COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

BOULLET, JEAN FRANÇOIS JULES ALEXANDRE, of La Chapelle, St. Dénis, near Paris, France. *Improvements in the manufacture of steel.* Application dated October 11, 1854. (No. 2174.)

This invention consists in constructing a cementing furnace having circulating flues on all sides of a cementing-box, with or without dampers for regulating the heat in different parts of the furnaces, and in forming steeling cement, of glucose, or other saccharine matter, horn shavings, or horn saw-dust, graves, &c.

CHIPPINDALL, ROBERT JOHN, of Rue de la Rochefocauld, Paris, France, gentleman. *An improved pencil-case.* Application dated October 17, 1854. (No. 2223.)

This invention consists in constructing a pencil-case in such manner, that by the application of pressure to a reacting spring a certain sheath may be forced back and the pencil forward as is required.

HALL, JAMES COOPER, of Monkwearmouth, Durham, ship-owner. *An improved windlass.* Application dated October 31, 1854. (No. 2312.)

The documents relating to this application are at present with the law officers.

TAYLOR, GEORGE, of Holbeck, near Leeds, York. *Certain improvements in mills for grinding corn and other substances.* Application dated November, 1, 1854. (No. 2319.)

These improvements mainly consist in balancing the bottom, or what is usually called the bed-stone, on an inverted steel point or spherical end-bearing in a corresponding cavity on the top of a spindle, the centre of the said steel point or spherical end being in or about the centre of the thickness of the aforesaid stone. The joint is to be surrounded by a reservoir containing oil.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Loughborough-road, Brixton, Surrey. *Improvements in the manufacture of wrought iron carriage and other wheels, and pullies.* (A communication.) Application dated November 17, 1854. (No. 2443.)

The inventor takes a blank larger in diameter than the finished wheel requires to be, and compresses it centripetally by means of rollers, or otherwise upsets the periphery until a flange is formed upon it.

COULSON, WILLIAM, of Fetter-lane, York. *Improvements in machinery for mortising, tenoning, and boring.* Application dated November 17, 1854. (No. 2444.)

These improvements consist in arranging certain mechanism to give motion to a vertical chisel or cutter, which is caused to descend upon the wood to be operated on by means of a long-hand lever working through the intervention of a screw and pinion-wheel, while suitable contrivances are added, in

order to adjust a nave felloe, or an ordinary piece of timber.

SPECIFICATIONS OF PATENTS FOR WHICH PROLONGATION IS SOUGHT.*

FOARD, EDWARD, of Queen's Head-lane, Islington, machinist, *An improved method or improved methods of supplying fuel to the fire-places or grates of steam-engine boilers, brewers' coppers, and other furnaces, as well also to the fire-places employed in domestic purposes, and generally to the supplying fuel to furnaces or fire-places in such manner as to consume the smoke generally produced in such furnaces or fire-places.* Patent sealed January 16, 1841.

This invention consists in the application of a door to the chamber or coking oven of furnaces or fire-places (fed from below by means of an ascending piston,) for facilitating the supply of fuel thereto; in a mode of supporting the burning fuel (while the chamber or coking oven is supplied with fresh fuel) by means of a sliding plate, when that plate is used in combination with the piston and chamber, or oven; and in a mode of applying within the chamber or oven a plate, arranged so as to dispense with the sliding-plate before mentioned.

TALBOT, WILLIAM HENRY FOX, of Locock Abbey, Wilts, esquire. *Improvements in obtaining pictures or representations of objects.* Patent sealed February 8, 1841.

This invention consists in employing gallic acid, or tincture of galls, in connection with a solution of silver, for the purpose of rendering paper (previously prepared) more sensitive to light; in making photographic images visible on paper, and strengthening and reviving such images by operating on them with liquids which act only upon those parts of the paper which have before been affected by the light; in producing portraits from life upon paper by photographic means; in employing bromide of potassium, or some other soluble bromide, for the purpose of fixing the images; in a method of obtaining photographic images upon copper by exposing the plate to the vapour of iodine or bromine, or the two combined, or either of them in combination with chlorine, and after it is taken from the camera, subjecting it to the vapour of one of the liquid hydrosulphurets; in applying coloured films, produced by a solution of lead, acted upon by a galvanic current, to the production of coloured photographic images; in producing thin plates of silver by immersing a thin precipitated layer of copper in a solution of silver; and in transferring photogenic pictures, obtained on sensitive paper, to metals made sensitive, by means of pressure and exposure to sunshine.

* These patents will be brought before the Privy Council for extension on January 10, 1855.—(See "Privy Council Appointments," page 575.)

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

REYBURN, ROBERT, of Baker-street, Greenock. *Improvements in refining sugar.* Application dated May 23, 1854. (No. 1150.)

This invention consists in so arranging the apparatus, that the portion of charcoal which is most exhausted may be from time to time removed, and fresh charcoal added at the end where the syrup escapes.

LEVEY, CHARLES, of Little Queen-street, Lincoln's-inn-fields, Middlesex, machinist. *Improvements in weaving bags and other tubular fabrics.* Application dated May 23, 1854. (No 1151.)

This invention consists in simultaneously working two shuttles when weaving bags and other tubular fabrics. For this purpose the loom is constructed and the harness arranged, in such manner as to open two sheds in the two warps at the same time, and the two shuttles are simultaneously thrown through the two sheds so opened.

LIVESEY, JAMES, of Bury, Lancaster, spinner and manufacturer. *Improvements in machinery for preparing or forming slivers of cotton, wool, and other fibrous materials for spinning or other purposes.* Application dated May 23, 1854. (No. 1154.)

This invention consists in the application to condensing carding engines of a combination of rollers in contact with each other, between which the stripping or strippings, sliver or slivers, to be condensed are passed, a revolving motion being given to them to pass the sliver forward, which, at the same time, is combined with a lateral reciprocating motion, the lateral motion of the rollers on opposite sides of the slivers being simultaneous and in opposite directions.

SMITH, JULIUS, of Henry-place, Bridge-street, and FRANK SANDOM THOMAS, of South-terrace, Walworth. *Improvements in steering ships and other vessels.* Application dated May 23, 1854. (No. 1156.)

"We employ," say the inventors, "in connection with the ordinary steering-wheel a screw shaft and nut of short rake and pitch, giving motion to a horizontal traversing guide-rod, which acts upon an oscillating drum-wheel, round which the steering chains are coiled. The interior of the drum-wheel is filled with a transverse cylinder containing a piston, against which volutes or spiral springs are caused to press."

LIPSCOMBE, FREDERICK, of the Strand,

Middlesex, water-filter manufacturer. *Improvements in guiding ships and boats.* Application dated May 24, 1854. (No. 1157.)

The inventor "places one or more boards of wood or plates of metal, or other material or combination of materials, on one or both sides of the keel of a ship or boat," as described by our correspondent W. L., of Portsmouth, Vol. LX., page 396.

LILLIE, JOSEPH, of Manchester, engineer. *Improvements in looms for weaving.* Application dated May 24, 1854. (No. 1158.)

This invention consists in dispensing with the lay or batten, and parts for working the same usually employed in looms, and in so constructing the shuttle, that the weft is deposited in the open shed by the shuttle itself, in the proper position for making cloth when the shed is crossed.

ASTON, EDWARD ONSLOW, and GEORGE GERMAINE, both of Millwall, Middlesex, master mariners. *Improvements in mariners' compasses, to counteract the effect of local attraction.* Application dated May 25, 1854. (No. 1162.)

This invention mainly consists in suspending the compass in connection with three or more deep copper basins placed one within the other.

CHEVRON, JEAN MARIE, of Paris, France, civil engineer, and CHARLES VICTOR FREDERIC DE ROULET, of the same place. *Improvements in textile fabrics, and in machinery for manufacturing such fabrics.* Application dated May 25, 1854. (No. 1163.)

This invention consists in making a novel kind of cloth or fabric by using in a certain manner two warps, one called the fixed or foundation warp, and the other the floating pipe.

M'GAFFIN, JOHN, of Liverpool, Lancaster, engineer. *Improvements in metal casks and tanks.* Application dated May 25, 1854. (No. 1170.)

This invention consists in manufacturing corrugated metal casks and tanks.

GOSSAGE, WILLIAM, of Widnes, Lancaster, chemist. *Improvements in smelting or reducing copper ores, and certain other metallic compounds.* Application dated May 26, 1854. (No. 1176.)

The inventor employs reverberatory furnaces for smelting or reducing copper ores after these have been calcined, but conducts the operation in such manner that in place of introducing fresh charges of calcined ore in a cold state into the smelting chamber, he causes the ore to be melted, or partially melted, previously to its being introduced; it is only needful, therefore, to increase its temperature to the requisite degree of intensity to obtain such a perfect fluidity of the slag produced from the ore, as to ensure the separation of the metallic compounds therefrom in the state of regulus.

DISTON, HENRY, of Cranbourne-street, Leicester-square, Middlesex, musical-instrument manufacturer. *Improvements in drums for musical purposes, and in the mode of supporting and keeping them in the required position when in use.* (A communication.) Application dated May 27, 1854. (No. 1178.)

These improvements mainly consist in a mode of tightening, loosening, or regulating the heads of drums by means of cords, screws, and grooves.

STEVENSON, JOHN, of Graslees, near Elsdon, Northumberland, farmer. *Improvements in ploughs.* Application dated May 29, 1854. (No. 1183.)

The principal improvement consists in the use of a mould board, which is so curved as to reverse or turn the sod completely over.

POWNALL, CHARLES JAMES, of Kensington, Middlesex, gentleman. *An improvement in communicating intelligence from one part of a railway train to another.* Application dated May 29, 1854. (No. 1187.)

This invention consists in the employment of the coupling chains of railway carriages as electric conductors for signalizing purposes.

TAYLOR, THOMAS, of Eddingley, Nottingham, agricultural implement manufacturer. *Improvements in machinery or apparatus for distributing manure and vegetable substances.* Application dated May 29, 1854. (No. 1188.)

This invention consists in distributing manure simultaneously with the delivery of the seed, by means of an Archimedean screw instead of fluted rollers, spoons, or forks, the screw being driven by means of a spur-wheel on the axle of the drill.

MORDAN, FRANCIS, of Frederick-place, Goswell-street-road, Middlesex. *An improved inkstand.* (A communication.) Application dated May 30, 1854. (No. 1192.)

This invention consists—1. In establishing, by means of a cock, a communication at will between the interior of the inkstands and the atmosphere through a small channel which crosses the tube, to which is adapted the key of the cock; and, 2. In the adaptation to the cock of an air-pump constructed of a small ball of caoutchouc perforated with holes.

HEINHOLD, EDOUARD, of Paris, France. *Improvements in diurnal and nocturnal indicating apparatus.* Application dated May 30, 1854. (No. 1195.)

Part of these improvements, relating to the names of streets, consists in adding to the name of the street on each plate, the numbers of the houses contained between that

place and the next name, and in distinguishing the different quarters or divisions of the town by marks; also in lighting up the names at night.

MIDDLETON, LEWIS STIRLING, of Glasgow, Lanark, manufacturer. *Improvements in the manufacture or production of ornamental fabrics.* Application dated May 30, 1854. (No. 1198.)

According to this invention the body or ground fabric is woven from yarns or threads of the colour of the intended ground of the piece, and, at the same time, certain stripes or lines of grey or bleached yarn are also woven in; the fabric is finally ornamented by printing a pattern on both sides of the stripes.

*** The documents of No. 1155 are with the Law Officers under first reference.

## PROVISIONAL PROTECTIONS.

*Dated November* 4, 1854.

2339. William John Wright, of Redcross-street, Cripplegate, London, snuff and tobacco manufacturer. The novel application of the stem or stalk of the tobacco leaf.

*Dated November* 7, 1854.

2355. Frederick Baxter, of Sneinton, Nottingham, silk throwster. A compound shell to be used as a destructive projectile to be discharged from the mouth of cannon or from mortars.

*Dated November* 24, 1854.

2482. Thomas Culpin, of Devonshire-terrace, Blackheath-road, Greenwich, Kent, engineer. Preventing waste of water, to be called a self-closing cock or waste water preventer.

*Dated November* 25, 1854.

2492. Thomas Greenshields, of George-street, Derby. Improvements in treating cotton waste that has been used by railway companies and preparing it to be used again.

2494. Walter Blundell, of New Broad-street, London, surgeon dentist. An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon, for the purpose of totally or partially benumbing the sense of feeling at the desired part of the human body.

*Dated November* 27, 1854.

2496. Joseph Gillott the younger, of Birmingham, Warwick, manufacturer, and Henry Gillott, of Birmingham, manufacturer. An improvement or improvements in metallic pens and new or improved machinery for the manufacture of metallic pens.

2498. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the manufacture of wrought iron deflassieux wheels for locomotives or railway or other carriages. A communication from Messrs. Deflassieux, Peillon, and Brothers.

2500. Charles Levey, of Red Lion-street, Holborn. Improvements in weaving bags and tubular fabrics.

*Dated November* 28, 1854.

2502. John Clarke, of Leicester, mechanic. Improvements in the manufacture of looped fabrics.

2503. Thomas Restell, of the Strand, Westminster, chronometer maker. Improvements in umbrellas, parasols, and cases or covers, and walking sticks.

2504. Thomas Staunton, of Vineyards, Bath, Somerset, gentleman. Improvements in obtaining motive power. A communication.

2505. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in steam boiler and other furnaces. A communication.

*Dated November* 29, 1854.

2506. Charles Peterson, of Low Cliff Chale, Isle of Wight, esquire. The application of a new vegetable substance to the manufacture of textile fabrics, and pulp for paper, cardboard, papier maché, and similar purposes.

2507. John Taverner, of Paris, France, confectioner. A new edible compound.

2508. Thomas Knight and Stephen Knight, both of Southwark, Surrey, manufacturers. Improvements in apparatus for heating water for baths and other purposes.

2509. John Abraham, of Standfield, Great Crosby, near Liverpool, Lancaster, gentleman. Improvements applicable to draining.

2510. George Gowland, of South Castle-street, Liverpool, Lancaster, chronometer and nautical instrument maker. Improvements in the mariner's compass.

2511. John Kealy, of Oxford-street, Middlesex, agricultural implement maker. Improved machinery for cutting up turnips and other roots.

2512. Sydney Smith, of Hyson-green Works, near Nottingham. An improvement in gauges for ascertaining the pressure of steam and other fluids.

*Dated November* 30, 1854.

2514. Sir James Caleb Anderson, of Fermoy, Cork, baronet. An economical railway for the conveyance of passengers, goods, and letters.

2515. Edward Welch, of George-street, Portman-square, London, gentleman. Improvements in fire-places and flues, and apparatus connected therewith.

2517. Jean Baptiste André Quiquandon, mechanician, of Ambert, French Empire. Certain improvements in manufacturing corks and in the mode of employing their residues or wastes.

2518. Edwin Pettitt, of Manchester, Lancaster. Improvements in machinery for drawing cotton and other yarns.

2520. William Taylor, of Howwood, Paisley. Improvements in steam boiler and other furnaces.

2521. John Sands, of Austin-friars, London. Improvements in the mariner's compass. A communication from William Graham, Australia, master mariner.

2522. Charles Murray, of Bignia Cottage, Havill-street, Camberwell. Improvements in the manufacture of ordnance, barrels of fire-arms, and hollow cylinders of iron.

2523. Frederick Le Mesurier, of Guernsey, gentleman. An improvement in the manufacture of ball and shot cartridges.

2524. Ellis Rowland and James Rowland, of Manchester, Lancaster, engineers. Certain improvements in metallic pistons.

*Dated December* 1, 1854.

2526. Edward Briggs, of Castleton Mills, near Rochdale, Lancaster, manufacturer, and William Souter, of the same place, manager. Improvements in machinery and apparatus for gassing yarn and thread.

2527. John Arrowsmith, of Bilston, Stafford, engineer. A new or improved method of construction, applicable to forts, floating batteries, powder magazines, beams, or girders, and other structures, where great strength is required.

2528. Julien Bernard, of Club-chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots, shoes, or other protectors for the feet, and in the machinery or apparatus connected therewith.

2529. Thomas Wilson, of Moscow-road, Bayswater, Paddington, Middlesex. Preventing the noise in omnibuses and other carriages travelling on common roads, streets, and railways.

2530. Thomas Restell, of the Strand, Westminster, chronometer maker. Improvements in guns.

2531. William James Cantelo, of Leicester-square. An improvement in the construction of barrels of ordnance and small arms, and in balls or projectiles used therewith.

2532. Thomas Littleton, of Saltash, Cornwall, bachelor of medicine and fellow of the Royal College of Surgeons of England. Improvements in separating gases from sewage and other waters, for the manufacture of manure, and for supplying of steam engines.

2533. Charles Iles, of Peel Works, Birmingham. Improvements in metal bedsteads.

### *Dated December 2, 1854.*

2534. Robert Christopher Witty, of Torianoavenue, Camden-road-villas, Middlesex, civil engineer. Improvements in illumination by means of artificial light.

2535. Richard Hess, of Chapel-cottage, Holloway-road, Middlesex, engineer. An improved voltaic battery, for medical and philosophical purposes.

2536. Dominique Bazaine, of Paris, France, head engineer des Ponts et Chaussées. An improved system of railway, applicable especially on common roads.

2537. Longin Gantert, dyer, Glassfort-street, Glasgow. Improvements in machinery or apparatus for dyeing and bleaching of yarns or threads.

2538. James Biden, of Gosport, Hants. The prevention of smoke from furnaces.

2539. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in apparatus for the manufacture of combustible gas. A communication.

2540. Auguste Edouard Loradoux Bellford, of Castle-street, London. Improvements in the manufacture of paper and pasteboard. A communication.

2541. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the manufacture of palm-leaf hats and carcasses for hats. A communication from Messrs. Langenhagen, Brothers, of Bas Rhin, France.

2542. Joseph Maudslay, of Westminster-road, Lambeth, Surrey, engineer. An improvement in ordnance.

2543. Edward Dowling, of Little Queen-street, Middlesex, scale maker. Improvements in weighing machines and in their application to implements of transport.

2544. Henry Strong, of Ramsgate, Kent, timber merchant. Improvements in the prevention of "back smoke" in chimneys.

2545. John Lister, of Ruthven, Perth, dyer. Improvements in the treatment or preparation of dyeing or colouring materials.

### *Dated December 4, 1854.*

2546. Robert Shaw, of Portlaw, Waterford, Ireland, cotton spinner and manufacturer. Certain improvements in looms for weaving.

2550. Edward Hammond Bentall, of Heybridge, Essex, ironfounder. An improved construction of locomotive steam engine.

2552. Daniel Collet, of Paris, Rue de Courcelles. Improvements in transmitting power.

### *Dated December 5, 1854.*

2554. Thomas Aimgill, of Busby, near Glasgow, Lanark, engraver. An improved meter for measuring water and other fluids.

2556. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the arrangement of electric telegraphs. A communication from Monsieur Brequet.

### *Dated December 6, 1854.*

2558. Augustus Thomas John Bullock, of Woolwich, Kent, lieutenant in the royal navy. An improved raft or apparatus for saving life at sea.

2560. Constant Costard and George Philip Collas, both of Jersey. Improvements in projectiles.

2562. John Gedge, of Wellington-street South, Middlesex. Improvements in closing, stopping, or securing the necks of bottles and other similar vessels. A communication from Auguste Rigolet of Marseilles, France.

2564. Albinus Martin, of Westminster, civil engineer. Improvements in the production of indigo dye colours in dyeing and printing textile fabrics and fibrous materials. A communication.

2566. Edward de Mornay, of Cork-street, Burlington-gardens, Middlesex, civil engineer. A new construction of guns, and a new form of projectile peculiarly applicable to such guns, but which can be also used for ordinary guns.

### *Dated December 7, 1854.*

2568. Joseph Phelps, of Croydon, Surrey, ironmonger. Improvements in apparatus for damping postage and other stamps, labels, and like articles.

2570. John Fairrie of Church-lane, Whitechapel. Improvements in preparing solutions of sugar for filtration.

2572. Ferdinand Collier Blumenthal, of Paris, gentleman, and Maximilian Louis Joseph Chollet, also of Paris, manufacturer. Preserving meats.

2574. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An apparatus for regulating tension in spinning-frames. A communication from Hippolite Chaverondier, of Saint Germain, Laval, France.

2576. Samuel Heseltine, of Harwich, Essex, gentleman. Improvements in the construction of cannon, shot, and shell.

## NOTICES OF INTENTION TO PROCEED.

*(From the "London Gazette," December 19th, 1854.)*

1744. Plato Oulton. Improvements in obtaining motive power.

1750. William Houghton Clabburn. Improvements in the manufacture of shawls and scarfs.

1752. Samuel Bickerton. An improved gas light governor or regulator, which invention is also applicable to regulating the supply of water and other fluids.

1764. George Weston. An improved veneering apparatus.

1766. John Petrie, junior. Improvements in machinery or apparatus for drying wool.

1779. Robert Cannon. Certain improvements in machinery for preparing cotton and other fibrous materials.

1785. Samuel Frankham. Improved means of consuming smoke and economising fuel in furnaces.

1790. John Lamb and Thomas Lamb. Improv

ments in Jacquard machinery and in the apparatus connected therewith.

1792. Thomas Wallworth. Improvements in purifying and treating grain, and in dressing flour and in machinery for these purposes.

1796. John Turner Wright, and Edwin Payton Wright. An improvement or improvements in the manufacture of ropes, cords, lines, and twines.

1911. Peter Armand Lecomte de Fontainemoreau. Certain improvements in apparatus for retarding and stopping railway carriages. A communication.

1947. Joseph Westwood and Robert Baillie. A method of protecting iron ships and vessels from corrosion and animal and vegetable matters.

1956. James Burns. Improvements in ventilating ships.

1962. Robert Macallister. An improvement in fitting or applying screw propellers to ships and vessels.

1985. Charles Wentworth Forbes. An improved rest for fire-arms.

2130. David Chalmers. Improvements in the mode or method of working railway breaks and communicating signals.

2155. George Thomas Selby. An improvement in furnaces.

2216. George Scheutz, and Edward Scheutz. Improvements in machinery or apparatus for calculating and printing the results of such calculations.

2235. Benjamin Nicoll. Improvements in shirt fronts.

2268. John Rickhuss and Charles Toft. Improvements in the manufacture of parian, porcelain, china, and earthenware.

2306. Pierre Benoit Chapuis. An improvement in the harness used for weaving. Partly a communication.

2481. Samuel Alfred Carpenter. A new or improved buckle or substitute for a buckle. A communication.

2484. Robert Willan and Daniell Mills. Improvements in looms.

2485. James Hartley. An improvement in the manufacture of perforated glass.

2496. Joseph Gillott the younger, and Henry Gillott. An improvement or improvements in metallic pens and new or improved machinery for the manufacture of metallic pens.

2510. George Gowland. Improvements in the mariner's compass.

2512. Sydney Smith. An improvement in gauges for ascertaining the pressure of steam and other fluids.

2518. Edwin Pettitt. Improvements in machinery for drawing cotton and other yarns.

2521. John Sands. Improvements in the mariner's compass. A communication from William Graham, of Australia, master mariner.

9523. Frederick Le Mesurier. An improvement in the manufacture of ball and shot cartridges.

2542. Joseph Maudslay. An improvement in ordnance.

2545. John Lister. Improvements in the treatment or preparation of dyeing or colouring materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

## WEEKLY LIST OF PATENTS.

*Sealed December* 15, 1854.

1354. George Henry Byerley.
1362. Thomas Rhoads.
1376. Astley Paston Price.
1389. Thomas Isaac Dimsdale.
1390. William Ellsworth Osborn.
1627. Francis Preston.
1805. Joseph Fowell Walton.
1856. Julien Louis Pierre Jean Baptiste Hector Bouvet.
2056. George M'Naught.
2161. James Shanks.

*Sealed December* 19, 1854.

1377. Astley Paston Price.
1380. Charles Phillips.
1386. Thomas Rudd.
1407. William Palmer.
1457. Joseph Sunter.
1467. Thomas Elliott.
1485. William Newzam Nicholson.
1505. The Hon. James Sinclair, Lord Berriedale.
1547. Charles Sewell.
1553. Jean Baptiste Dechanet and Antoine Dominique Sisco.
1569. John Lockhart, junior.
1907. William Campion.
2076. Joseph Boulton.
2109. Thomas Sherriff.
2209. Nathan Thompson, junior.
2263. Gustavus Adolphus Somerby and Charles William Fogg.
2265. Ferdinand Charles Warlich.
2275. Colin Mather.
2325. Joseph Francis.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*A Manchester Chemist.*—Your letters have been received, and will be inserted on our receiving your name and address (confidentially.) The subject of them is one which renders this precaution, on our part, necessary, as you know.

*B. Cheverton.*—Yours reached us too late for insertion in this number.

*G. B.*—You appear to have taken some pains in stating preliminaries, but your question—viz., "By this last movement does the *axis* revolve?"—is unintelligible to us.

*J. H. R.*—Yours shall be attended to.

*F. R. S.*—You have mistaken the aim of Dr. Whewell's Essay. We cannot do better than quote the following from his concluding chapter. He there says:—"Yet the reasonings which we have, in various parts of this Essay pursued, will not have been without profit, even in their influence upon our religious thoughts, if they have left upon our minds these convictions—that if the analogy of science proves anything, it proves that the Creator of man can make a Creature as far superior to Man as Man, when most intellectual, moral, religious, and spiritual, is superior to the brutes: and again, That Man's Intellect is of a divine, and therefore of an immortal nature."

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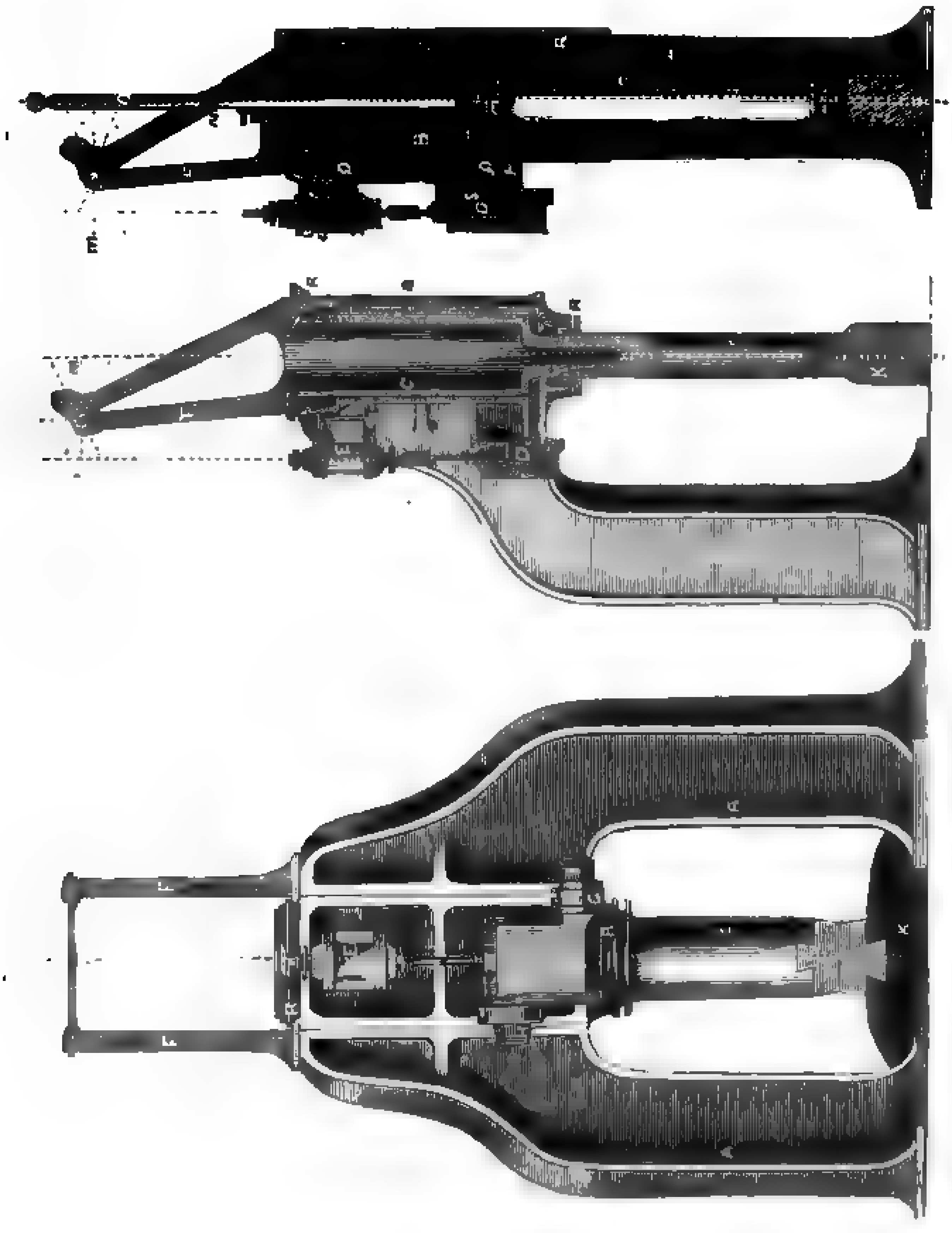
LONDON: **Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne. Paris; Machin and Co. Dublin; W. C. Campbell and Co., Hamburg.**

# Mechanics' Magazine.

No. 1638.] SATURDAY, DECEMBER 30, 1854. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

## RIGBY'S PATENT STEAM HAMMERS.



## RIGBY'S PATENT STEAM HAMMERS.

(Patent dated January 5, 1851.)

Mr. W. Rigby, of Glasgow, patented on the above day certain improvements in direct action steam hammers, which are applicable when steam is used for effecting the ascent of the hammer only, and when it is employed both in the ascent and descent.

The invention as applied to the first class of hammers, consists in making the hammer block itself in the form of a plunger or ram, passing through stuffing boxes at each end of the cylinder; the plunger or ram being of larger sectional area at the part passing through the top gland than at that passing through the bottom, so that on steam being admitted into the cylinder its pressure will act on the difference of the areas of the two ends, and will raise the ram to the required height; and on the steam being allowed to escape, the ram or hammer will fall by its own gravity, and will be guided by the cylinder and stuffing boxes, without the aid of guides above or below the cylinder, as heretofore used. And as applied to the second class, it consists in making the ram work through the bottom only, instead of prolonging it through the top of the piston, and the top of it forms a piston for the steam to act upon both in its ascent and descent, the cylinder and lower stuffing box or gland serving as the guides for the hammer.

Figs. 1, 2, of the engravings on the preceding page, are different views of the single acting plunger hammer; fig. 1, being a front elevation, and fig. 2, a side view, showing the cylinder and plunger in section. A are the side standards for carrying the cylinder, which is securely bolted to them; in the figs., these standards are shown placed at a considerable angle with the central line of the cylinder marked I, for as they are not required to serve as guides for the hammer block, they can be placed in any position, so as to allow of clear access to the anvil block, K, both from the sides and front, if required: or they may be placed in the usual position. B is the cylinder, into which the steam is admitted in the usual manner by the slide valve, D, which is opened by the piston in the small cylinder, E, and reversed at the proper time by the action of the plunger against the lever, M, the central lines of which are shown in red ink; and upon the valve being so reversed, the steam will escape in the ordinary manner, and the hammer will fall by its own gravity; the arrangements for varying the height of fall and force of the blow of the hammer can be of the usual description, and modified according to circumstances. C is the plunger or ram, which is shown in fig. 2 in section, the upper part, which works through the top of the cylinder being cylindrical in cross section, and the lower part being made oval, elliptical, rectangular, or of any other form required that can be made to pass through a steam-tight stuffing-box (provided it be not made of a circular section), so that it will be prevented from turning by its own form when taking down collars of shafts, forging the bosses of cranks, and the like, and thus obviate the necessity for the parallel guides heretofore used; and the upper or larger part of the ram being turned to fit the cylinder, the hammer will be well and securely guided by its contact with the cylinder itself, in addition to the glands, R, at the top and bottom of cylinder. F are the standards for carrying the valve gear. G is the steam pipe for admitting the steam; and H is the pipe for the exhausted steam to escape by. Fig. 3 is a view of the double-acting hammer, in which A are the standards for carrying the cylinder, B; C is the hammer block, the upper part of which forms a piston, so that on the steam being admitted below it by the slide-valve, D, it will rise until the tappet N on the piston-rod, O, which is attached to the hammer, reverses the slide valve by its action on the lever, M, and opens a communication by the passages P and Q between the bottom and top of the cylinder, when, owing to there being a larger area on the top of the piston than the bottom, the hammer will fall not only with its own gravity, but be impelled downwards by the action of the steam, and be guided in its fall by the piston, which is made more than usually deep, and by the gland, R. Upon the valve being again raised by the piston in the small cylinder, E, the passages Q and S are opened to each other, and the steam from the top of the piston escapes into the atmosphere by the exhaust pipe, H, which leads out of the passage, S. The piston or upper part of the hammer block, C, is turned cylindrical, so as to fit the cylinder, but the lower part is made as described before for the plunger hammer, for the reasons already stated.

## INSTITUTION OF CIVIL ENGINEERS.

### ANNUAL GENERAL MEETING.

*James Simpson, Esq., President, in the chair.*

The Annual Report of the retiring Council was read, and the meeting proceeded to the election of the President, Vice-Presidents, and other members of the Council

for the ensuing year, after which the medals and premiums which had been awarded were presented.

The leading events of the political world, and particularly the occurrence of war, were alluded to, as having tended to arrest the progress of civil engineering works, whilst, on the other hand, the mechanical engineers had found ample employment in supplying engines, machinery, vessels, tools, and stores of all kinds for the use of the army, the navy, and the mercantile service. The fact of the aid of civil and mechanical engineers being so extensively sought for, in conjunction with the army and navy, was alluded to, and the cases in which their combined efforts had conduced so essentially to mutual benefit were shown. Allusion was also made to the novel expedient of sending out a corps of "navvies" and other artizans to lay, as it was expressed, "the first section of the railway from Sebastopol to St. Petersburg." The production of the Lancaster rifled cannon, and of the wrought-iron ordnance by engineers, and the investigation for the government, by a member of the Institution, into the manufacture, boring, and firing of rifles, were noticed.

The few large works of civil engineering now in progress in Great Britain were then mentioned; and the impetuous onslaught of the Home Secretary upon the smoke and other nuisances of the metropolis was noticed, with the view of directing to those points, as also to the general sanitary questions and to the sewerage of the metropolis, the attention of civil engineers, whose advice would be found trustworthy, and who would discriminate between sound systems and the nostrums and baseless schemes which were now ignorantly thrust forward.

The extensions of the feeding mains of the principal water companies to points high up the river, beyond the influence of the tidal range, and, in two cases, the removal of the entire establishments, in order to afford almost unlimited supplies of the best water for domestic purposes, was noticed; and it was pointed out that it was now only necessary to afford such an ample supply of water, at a sufficient elevation on the north side of the metropolis, as would enable the sewers to be constantly flushed, and that their contents should be delivered at positions so low down the Thames as to preclude the necessity for the mechanical lifting of the sewage, excepting for a limited area, and for those portions under high water-mark; and thus the noble metropolitan river might be rendered as pure as was practicable for a stream flowing amidst habitations, and necessarily subject to some degree of pollution.

A slight sketch was given of the progress of railways on the Continent, in the Colonies, in America, and, in fact, throughout the world; and in every quarter members of the Institution were to be found earnestly pursuing their calling.

The successful opening and subsequent progress of the Crystal Palace at Sydenham was noticed; and it was shown that in the projection, the prosecution, and the support of this great work, many of the members had been actively engaged; and the same energetic aid was asked for the approaching "Exposition" at Paris in 1855. The Council had given their best aid to the Government in the matter, and it was specially impressed on members to send only such models and specimens of works and machinery as should sustain the high character of the British engineers and manufacturers.

A sketch of the statistics of railways in Great Britain was then given. It was also represented how essentially the civil engineers could contribute to the investigations of antiquaries and archæologists, by immediately reporting to the Antiquarian Society the finding of any objects during the course of excavations, and by transmitting the objects found to that Society for a report before depositing them in the national collection at the British Museum.

Sketches were then given of the subjects of the prinicpal papers read during the past session, for part of which Telford medals had been awarded to Messrs. Beardmore, Henderson, Smith, Hobbs, and Yates; and Council premiums of books to Messrs. Harrison, Clark, Simpson, jun., Peniston, and Chadwick, which, in the course of the evening, were duly presented, the president noticing the advantages to be anticipated from the examination, by Mr. Henderson, of the great steamers and other large vessels of the present day; alluding also to that now building by Mr. Scott Russell, under the direction of Mr. Brunel, V. P.; the valuable inquiries opened by Mr. Harrison's view of the state of the drainage of the district south of the Thames; Mr. Beardmore's and Mr. Peniston's account of the works of improvement on the Lea, and of a tunnel on a railway; Mr. Pigot Smith's paper on Macadamizing the streets of towns; Mr. Simpson, junior, on the smoke question; and Mr. Chadwick on water meters, all subjects of importance in a sanitary point of view; Mr. Clark's description of the novel mode of propulsion exhibited by the *Enterprise*, intended especially for the Deep Sea Fishing Company; Mr. Hobbs on locks, eulogising particularly the honesty of purpose, and the temperate enunciation of startling facts exhibited in the communication; and Mr. Yates's paper on the Decimal

Coinage, &c., in the investigation of which much industrious research had been shown.

Numerous valuable presents of books, maps, charts, &c., were announced, as also the presentation of the portrait of another past president, Mr. Joshua Field. Special allusion was made to the bequest of the late Mr. B. L. Vulliamy, Assoc. Inst. C. E., of a large and very valuable collection of works on horology, second only to the collection in the library of the Clockmakers' Company. The thanks of the meeting were unanimously given, with a vote of condolence to the family on the loss they, in common with all his friends, had sustained, in the decease of Mr. Vulliamy.

The resignations of fourteen members and associates were announced.

The financial statement showed the funds of the Society to be in a very prosperous state, since, by the voluntary contributions of the members of all classes, the printing debt had been paid; and after giving the detail of a special general meeting of members, convened for the purpose of introducing some modifications into the by-laws, which had, however, been demonstrated to be unnecessary, and therefore were not made, the report concluded by announcing that two parts of volumes xi. and xii. (together upwards of 800 pages) of the Minutes of Proceedings had been issued, and the editing and printing of all the remainder would proceed with all dispatch.

The thanks of the Institution were unanimously voted to the president, vice-presidents, and other members and associates of council, as also to the auditors, the scrutineers of the ballot, and to the secretary, for their several services.

The following gentlemen were elected to fill the several offices in the Council for the ensuing year:—James Simpson, President; G. P. Bidder, I. K. Brunel, J. Locke, M.P., R. Stephenson, M.P, Vice-Presidents; J. Cubitt, J. E. Errington, J. Fowler, C. H. Gregory, J. Hawkshaw, T. Hawksley, J. R. M'Clean, C. May, J. Penn, and J. S. Russell, Members; and H. Hensman, and Sir J. Paxton, M.P. Associates.

## COMPASS VARIATION AND COLLISIONS AT SEA.

THE following is an extract from a letter of Lieutenant Maury's, which was read before a meeting of the managers of the Life Saving Benevolent Association:

"National Observatory, Washington,
"Nov. 7.

"Dear Sir,—I received, by due course of mail, your note with an account of the proceedings which took place before the British Association, concerning the errors of ships' compasses.

"There is a liability of the ships' compass to error, which none of the rules as yet laid down seem sufficient to detect, and it appears to have been an error from this source which led to the loss of the *Tayleur*.

"Magnetists have not been able to devise any plan for preventing or detecting these errors at all times. They can, however, be always detected when the sun or the stars are out, and in cloudy weather a close attention to the mariner's three L's, (log, lead, and look-out,) will go far towards preventing mischief.

"Every vessel, and especially those in the European and Californian trade, should be provided with an azimuth or standard compass; and whenever sights are taken for chronometer, observations should also be made for variation. For this purpose, a place near the middle of the quarter or hurricane deck, and as far from any iron as possible, should be marked, and upon that spot the azimuth compass should always be placed when an azimuth or amplitude is to be taken; and on every such occasion the heading of the ship, both by the standard and the steering compass, should be noted, entered in the log, and allowance made according thereto for the courses steered by the binnacle or steering compass. The difference between these two compasses will be greater on some courses than on others. But most American navigators know the cause of this difference, how to detect it, and how to allow for it; and therefore it is unnecessary further to allude to the subject of 'Local Deviation.'

"In addition to these precautions, a 'tell tale' compass under the fore or maintop would be further removed than any of the compasses below, from the varying magnetism of the vessel, and I would recommend it especially for steamers, as a useful check. In case of no top, a place might be made especially for its accommodation aloft. I allude to the dangers of deceitful compasses on Californian or European voyages especially, because vessels trading thither are so often enveloped in fogs as they near the land by the way; and because we have more steamers plying to those foggy ports than to any others. But what remedy can we provide against the liability to such dreadful disasters as that which befel the *Arctic*? The three L's do not constitute a sure preventive. I have reflected much upon the subject, and I like the ideas of my friend R. B. Forbes, of Boston, better than any I have heard. He proposes a double track across the Atlantic for steamers. By having one route for them to go and another for them to come, we should not avoid entirely, but

we should greatly lessen, the liability of collision. If steamers would agree to follow two such routes I think I could lay them off so as to have them quite separate except at the two ends, without materially lengthening the passage either way."

## TALBOT'S PHOTOGRAPHIC PATENT:—LAW CASE.

### COURT OF COMMON PLEAS.

*Talbot v. Laroche.*

*Tried before Chief Justice Jervis and a Special Jury.*

This was an action to recover damages for the infringement of the patent granted to the plaintiff on February 8, 1841, for improvements in obtaining pictures and representations of objects, described on page 619 of our last number.

Sir Frederick Thesiger, Mr. Groves, Q. C., and Mr. Field (instructed by Messrs. Price and Bolton), appeared for the plaintiff; and Mr. Serjeant Byles, Mr. Willes, and Mr. Hannen (instructed by Messrs. Fry and Loxley), were for the defendant.

The hearing of the case occupied the Court two and a half days, and a great mass of scientific and other evidence was given.

The questions raised for the jury were whether the plaintiff was the first and true inventor of the process, and if so, whether the collodion process was an infringement of it.

The Chief Justice, in summing up, stated that the case was one of infinite importance to the parties concerned. It was most important both for the interests of the parties, of the public, and of the trade, that it should be determined whether the process used by the defendant was an infringement of the plaintiff's; and it was also of great importance to ascertain whether Mr. Talbot or Mr. Reid, both gentlemen of great learning, talent, and scientific attainments, which of them was the first inventor of this process; or it might possibly be that each of them, by an independent course of experiments, had arrived at the same or similar results. It was also of great importance to the trade, and they had heard that subscriptions had been got up to defend this action, to ascertain whether the collodion process was an infringement of the plaintiff's; for if it were, Mr. Talbot would have the power to prevent all the numerous persons who were now using that process of doing so in future without his license. His lordship then analysed with great minuteness the curious details of the different plans, and concluded an able summing up by leaving the question for the consideration of the jury.

The jury, after having been absent from the Court for three quarters of an hour, returned and stated their finding to be, that Mr. Talbot was the first and true inventor within the meaning of the patent laws; and, on the other part of the case, they found that the defendant was not guilty.

## PATENT CASES IN EQUITY.

### NO. I.

### RAILWAY AXLE-BOXES.

We have been informed, by a circular from the parties concerned, that the litigation respecting railway axle-box patents, against which, or in anticipation of which, our recent articles were published, has been avoided, the proprietors of Normanville's and Vigurs' patents having combined their interests, and purposing for the future to work the two patents together. Since, however, the original patent of Mr. W. B. Adams remains in the hands of, and is still worked by, its inventor, we do not see how the combined patents can be made use of by manufacturers and companies with security.

## FORMATION AND COMBUSTION OF SMOKE.

*To the Editor of the Mechanics' Magazine.*

Sir,—I must again ask you to correct an error in a page of yours. I have observed some misrepresentations in the letters written recently in your journal by a person, whose language is such as effectually to secure him from reply on the part of a gentleman. I have no intention of noticing these, or the grave charges which are insinuated against me in the same letters. One misstatement, however, may be pointed out as an example, not in justice to myself, but to put on their guard your readers, who might be misled by it. I do not suppose that many people will take such interest in the matter of the letters to which I allude, or be so captivated by the style of them, as to be induced to follow this writer in his arguments, and to collate with the original sentences each passage which he cites. I will, therefore, just institute one comparison for the benefit of any of your readers who may have happened to look through your recent smoke-correspondence.

At p. 609, col. 2, in your No. 1637, I observe these sentences. The first of them is inserted there as a quotation from a letter which you printed for me some weeks ago. It purports to be my description of furnace-smoke.

"'The lamp-black floats on in the current

of carbonic acid and steam, mixed with the nitrogen of the air, for such is the atmosphere which leaves the fire-place soon after coaling, and passes to the chimney.' Now" (this writer continues for himself), "if Mr. Mansfield would but fairly examine this, his own description, he must see that it furnishes unmistakable evidence that smoke cannot be burned; for if it consists, as he truly states, of steam, carbonic acid, and nitrogen (all incombustible, and passing off in clouds), while the carbon is so comparatively insignificant in amount, how is this cloud of incombustibles, with its grain of mustard seed of carbon, to be raised to the high temperature of ignition?"

Now, I was not a little astonished at reading that I had made the statement here cited and commented upon. For one of the chief objects of the letter of mine, from which this passage is supposed to be taken, was to point out a fact, which I believe is commonly lost sight of—to wit, that smoke consists in large part of the vapour of tar. Further, I thought I had stated that tar-vapour is combustible, but that it requires a high temperature for its inflammation, and that therefore the readiest mode of setting fire to it, is to supply it with hot air.

Accordingly, I turned to my said letter, to see whether I had committed so stupid an oversight as to write the sentence above attributed to me. Here I find at p. 368, col. 2, in your No. 1627, the following two sentences, which form the only passage in my letter that resemble the sentence above recited sufficiently to allow me to think, that it is the passage which your correspondent intended to quote.—

"The lamp-black carbon floats on in the current of carbonic acid and steam, mixed with the nitrogen of the air, *and with the unburnt residual tar vapours of greater density*. Such is the atmosphere which leaves the fire place soon after coaling, and passes....etc."

What I wish to point out to the person who has commented on my words, and to your readers, is the very remarkable omission, in his citation, of the clause here printed in italics. Of course, the omission was not intentional; but it is very curious that he should have allowed the printer to drop, by accident, the very words which were the pith of my sentence, and the marrow of my argument.

If any one of your readers still believes that smoke cannot be burned, that is to say, for practical purposes, consumed, he may satisfy himself by the following child's experiment.—Let the bowl of a clay tobacco-pipe be filled with coal-powder, luted over with clay, and put into the fire in a common hearth. Let the nearest child or adult, of either sex, be asked what the fumes are, which will soon be seen issuing from the tube-end of the pipe. He, she, or it will answer, "Smoke." Let a lighted candle then be applied to it. I tried this experiment when I was an occupant of the nursery.

I am, Sir, yours, &c.,
CHARLES BLACHFORD MANSFIELD.

Weybridge, Dec. 25, 1854.

## PATENT RE-INVENTIONS.

*To the Editor of the Mechanics' Magazine.*

SIR,—As you are knowing in all the niceties of the new patent law, I beg your advice. In 1839, induced by the following circumstances, I took out a patent for a mode of introducing the air to my furnaces. I had observed that air, admitted to the furnace, often produced a cooling effect; but that no such effect was perceptible in the common Argand gas burner. Examining both with great attention, there appeared no practical difference, except that in the Argand lamp the air and the gas were brought into contact by means of *numerous small orifices*, and that their atomic mixture was thus effected with greater rapidity.

I remembered also having seen Professor Brande showing, by a simple experiment, that it was immaterial whether the gas was brought to the air, or the air to the gas. He introduced a jet of air into a jar of gas: and then, a jet of gas into a jar of air; the result being, in both cases, clear flame, immediate combustion, and no smoke. Here, then, I saw, lay the whole secret. Taking the idea from these hints, and the Argand burner, I proceeded with my patent.

To put this my invention of the Argand furnace in a clear, unmistakable point of view, I give it in the appropriate words of Professor Brande in his letter to me, dated 26th November, 1840, viz.:

"You admit a number of jets of air into a heated inflammable atmosphere. In this way, each jet of air becomes, as it were, the source or centre of a separate flame; and the effect is exactly that of so many jets of inflammable or coal gas, ignited in the air; only, that in your furnace you *invert this ordinary state of things*, and use jets of air into an atmosphere of inflammable gas; thus doing, upon a large and practical, what I have often done on a small and theoretical scale, in illustration of the inaccuracy of the common terms of *combustible* and *supporter of combustion*, as ordinarily applied." Here, then, is a true summary both of the apparatus and its effect, claimed by my patent. Though thus quite sure, both chemically and practically, that I

was right, nevertheless I was baffled in the result, for, as Burns says—

"The best laid schemes o' mice an' men,
gang aft a-gley."

Leaving chemical and practical authorities aside, I then consulted one of the "knowing ones" in the *patent line* in London:—one who well knew *what was what*. Instead of promising success, he, however, at once dashed my basket of eggs to the ground. He in plain words showed how many fatal mistakes I had made. In my simplicity, I had described my invention exactly as it was. I had made no concealment, nor had I added anything that was not absolutely necessary. Now, had you, said my *knowing* friend, first come up to London, where, alone, all good (that is all paying) patents are brought out, and consulted some of those *talented* men who know how to manage that curious animal—the public, he would have told you, that, instead of simplifying your apparatus and process, you should have given it an air of complicated ingenuity, and even mystery, by the aid of some apparently expensive, (though utterly useless,) adjuncts.

Again, he would have *proved* to you, that instead of making the invention available at a *small cost*, you should have done just the reverse: and, as the more worldly-wise class of patentees do, have made it both costly and troublesome to erect; thus, to justify a good round charge, beginning with a high price for "*Royalty*,"—that's the term. Neither cheap patents nor cheap physic will go down. Besides, what is cheap is always associated with what is bad. Above all things, said my knowing Mentor, you should not have said a word about the chemistry of the thing, except to mystify. People in the mass don't understand chemistry, though they don't like to say so. On the other hand, every one, from Lord Palmerston and his legal adviser who prepared the new act, down to Messrs. Woodcock and Mansfield, know all about the burning and consuming of smoke; although it must be confessed, the chemists have not yet discovered how it is to be done, *mais, n'importe, c'est egal.*

Besides, said my friend, you should have adopted the popular cant of hot air, cant though it be. You should have contrived some apparatus to heat the air, and *intensely*, too; or, what would answer just as well—*say* it did so. Only, said he, observe how Lee Stevens managed to heat 100,000 cubic feet of air by a few handfuls of scoriæ!

Now, Mr. Editor, having heard my case, please to inform me if there be anything in the new patent law that can prevent my *re-inventing my own invention, and re-patenting my own patent*; or say, if I am debarred doing what so many others daily do with them?

Having now by experience learned a thing or two, I propose then, first, to get up a company (of course in the Metropolis); nothing will do without a company. Prideaux soon found that out, seeing the thousands that must be expended in *bringing a thing well out*. I propose my company shall be denominated the "*Universal-Economico-Fumifero-Utilization Company*." At its head, as manager (interested in its success, of course), will be some clever unscrupulous fellow, who will go about with restless and resistless importunity among the smoke producers; one who will neither be put down, nor put off; who, free of both speech and pen, will not hesitate to guarantee anything, even to a saving of full 49½ per cent. He must be able to write editorial original paragraphs; and, no matter how, get them inserted, to be afterwards quoted as, "the opinion of the press." (For good samples, see the *Times* of December 22, 1853, and January 3, 1854.)

Again, my manager must have such a smack of chemistry as will enable him to pour forth a mass of scientific rubbish, as difficult to be seen through as the densest smoke which he can consume; proving, for example, how the benzole, totuole, cumole, cymole, and rigmarole, can all be simultaneously and consecutively converted into lamp-black smoke, then into "a highly combustible gas," and finally and fairly burned, or consumed, or prevented, or subdued,—as the case may be.

My London adviser says I must positively bring out something new in the way of mechanical apparatus or adjuncts, and not leave my mere perforated diffusion-plate to stand the fire of inquisitive engineers among the manufacturers. This is my great difficulty. "*Movable bars*" have long since been brought to a stand. *Venetian blinds* are beginning to be seen through since Prideaux adopted them to make the air intensely hot, and Woodcock to keep it "literally as cool as a cucumber." *Calorific* fiddlesticks have lost their attraction, while *supplemental grates and plates* have been fairly dished since Lee Stevens has discontinued them, although he had vouched (and on his own authority too) that "the air, passing through the two strata of fire, is so intensely heated as continuously to produce perfect combustion of the gaseous products of the fuel." It is true, though it need not be put down in our new circulars, that chemists have shown that all the heat in the world would not effect the combustion of the gas, although cold air would. However, as Lee Stevens is a later, and of course better authority, he has shown "*que nous avons changé tout cela.*"

Now, as precedents and authorities for the existence of the re-inventing process I

will supply some, and not travel out of the record of your own pages, premising that my invention was for "the use, construction, and application of the *perforated air-distributors*, by which the atmospheric air was more immediately and intimately blended with the combustible gases generated in the furnace."

In your Number for December 2nd is mentioned Hill's patent for "preventing *or* consuming smoke." (It appears he has not yet determined whether his patent shall undertake the *consuming* smoke or the *preventing* any being made.) His means, however, are "the employment of a perforated wall or grating."

Again, in your Number for October 28th I find Woodcock's smoke-consuming furnace (since changed to a "smoke-preventing furnace"), and which consists of a "plate with *numerous perforations, through which the air is admitted.*"

Again, in the Number for November 4th is mentioned the patent of one of your right thorough-going, unscrupulous re-inventors, by name O'Regan, of Liverpool, which consists of "certain mechanical arrangements for *admitting air in a divided form.*" Having seen these "arrangements," I can inform you that they are identical with my perforated plate as described by Doctor Ure in his "Dictionary of Arts."

Again, in your Number for November 4th "Parker's smoke-consuming apparatus" is described as a moveable iron chamber, *perforated at top*, and through which perforation the air enters *in a divided state.*

Again, Prideaux's furnaces, besides the usual *quantum suff.* of appendages (utterly unnecessary as regards combustion, but absolutely necessary for giving the requisite amount of complication and ingenuity), are thus described by himself: "The air should pass into the furnace through a *series of perforations*, thus effecting its *subdivision into minute jets.*" But I need not go further in the list.

Now, Sir, in serious earnestness I ask, can nothing be done to protect the numerous class of really ingenious *first inventors* from the vampires of the *re-inventor* class? Is there no public prosecutor to bring to the bar of public indignation the robbers of the property and fair fame of others? Is there to be no other way of carrying out the provisions of the new smoke-nuisance act than by handing over the unfortunate offenders to the tender mercies of unscrupulous empirics? To compel a man to remove the filth issuing from his factory is an intelligible exercise of legal authority, both the nuisance and the remedy being unquestioned; but to compel a manufacturer to "consume the smoke issuing from his own furnace or chimney-stack," under the threat of accumulating penalties, is unmitigated oppression; seeing, 1st. That the very nature of the offence, or even what *smoke is*, remains still *sub judice*. 2nd. That the legislature has indicated no means by which this new offence may be avoided. 3rd. That the magistrate who has to administer the law is unable to tell the unconscious victim how to avoid its penalties.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, November 23, 1854.

*Postscriptum.*—By your Number of this day, I see Mr. Woodcock has fairly come out. With the view of encouraging this modest and unassuming *debutant*, I will, in due course, pay my respects to him. Mr. Woodcock has quoted the ancient classic, *Horace*, in aid of his theory of smoke-burning, and extracting flame and light from smoke: "*Ex fumo dare lucem.*" Now, although Horace may, in this nineteenth century, be a rather *questionable* authority on gas-light, he was, *unquestionably*, a good judge of human nature and its weaknesses. As being quite in point on the subject before us, I therefore quote his well-known apothegm, and which had suggested the *tone* of the preceding letter;

> "Ridiculum acri fortius ac melius plerumque secat res."
>
> "Ridicule will oft prevail.
> And cut the knot when graver reasons fail."

I believe, Sir, this will be found to be the most appropriate application to the back, not only of obstinate and empty folly, but of smoke-burning and hot-air quackery.

## ON THERMOGRAPHS.

*To the Editor of the Mechanics' Magazine.*

Sir,—A proof that it is no easy task to construct a simple, practical, and accurate "thermograph" is, I think, established by the fact that none has yet been generally adopted for scientific purposes.

M. Bréquet, of Paris, has devised a metallic thermometer (based on the unequal expansiveness of solid metals), which, through the action of clock-work, gives the temperature from hour to hour. This thermometer could of course be improved, so as to give the temperature at much shorter intervals of time, or perhaps in a continuous manner. But this improved thermograph would be less simple, and, I believe, less trustworthy than one founded on the expansiveness of mercury.

The idea of your correspondent, "J. M.," of registering the motions of needles on photographic paper, is, I think, very good. I see, however, some disadvantages in regis-

mercurial thermometers in a similar 'hen used for scientific purposes.
produce a uniform motion of the pa- more complicated machinery would ited than that which I proposed for g the plate of the apparatus described r last two numbers: for, this motion have to occur in an additional dark a. Moreover, since photographic pa- ist not be transparent, the benefit of s-for-all graduated plate, which, be- saving time, must greatly contribute accuracy of the indications, would be

parts of the mercurial thermograph, would not be required in that men- by "J. M." are the float and the rod. e other hand, the production of a heatless, and intense light in the and in the open air, would demand special apparatus.
ay be found simpler to use a circular instead of a rectangular one, since plate could be made to rest entirely axis, set in rotation by the clock- The central portion of such a plate not be graduated, owing to the con- ce of the radii. The lines giving the s would be concentric circles, and giving the time, radii. This method, er, might lessen the compactness of strument.
curve of temperature could be copied rectangular graduated paper with the acility, whether a circular or a rect- ar plate be employed.

I am, Sir, yours, &c.,
C. J. RECORDON.

ridge, Dec. 26, 1854.

## )DUCTS FROM COAL TAR:— BENZINE.

*e Editor of the Mechanics' Magazine.*

—In reply to the letter of Mr. Mans- which appeared in your valuable d of the 16th inst., I beg to state, have no time for entering into a aper controversy, more particularly he chief points are personalities. As rights of invention for the commercial ation and applications of benzine, it bject to be decided by courts of law t by the assertions of a conceited and ded inventor.
ish Mr. Mansfield to remark, that I in my lecture that I was not the or, but simply the party to whom the ery of the preparation and applications zine had been confided. The exten- nployment which that substance has received on the continent justify the value of Mr. Pelouze's benzine.

I am, Sir, yours, &c.,
F. CRACE CALVERT.

Manchester, Dec. 26, 1854.

## ON THE ROTATION OF THE MOON.

*To the Editor of the Mechanics' Magazine.*

[WE hope the following letters will set this subject at rest, as we do not wish to carry it forward into our next volume.]

*The Sun.*

Mr. Editor,—It is not often that I trouble myself with extra-solar matters, but I really cannot refrain from expressing my astonishment that any one should question the fact of the rotation of the moon about an axis in her own body. I do assure you, Sir, that we solar inhabitants can see all sides of the moon within a period of time corresponding very nearly to your month; and it is clear enough that if it had no axial motion, but only an orbitual one, we should only have the pleasure of seeing one of its phases, while you terrestrials would see every point in its surface successively. But to have produced this result it would have been necessary to give the original creative impulse through the centre of gravity; the Creator chose not to do so, and, as in the case of the earth, caused the direction of the impulse to pass without the centre, so arranging the distance from the centre as to make the axial and orbitual revolutions occupy the same time.

It is hardly necessary to say that in this, as in that of the earth, and all other cases of planetary rotation, the axis is moveable.

I am, Sir, yours, &c.,
ABDIEL.

*To the Editor of the Mechanics' Magazine.*

SIR,—In common with many other of your readers, I was beginning to despair of finding any ground in common with Mr. Mushet on which to discuss the question of the moon's rotation, until in your last Number he gave us a *locus standi*, by frankly accepting the meaning of the terms *axis* and *rotation*, as currently received by scientific men. He moreover seems to have some idea of the meaning of the terms, "motion of translation," and "motion of rotation;" as, for instance, where he says, "When there is a true rotation on an axis, as in the case of the earth, we have the two motions, as designated, of 'translation' and of 'rotation.' When there is no rotation, as in the moon, we have the motion of translation only."

Does he, however, understand or apply the idea of motion of translation as explained and employed by mathematicians, and that upon very sufficient grounds? Let us see. A body is said by mathematicians to have only a motion of translation, when every particle of it moves exactly in the same way as the centre of gravity. If the other particles, or any of them, have a different motion from this point, either as regards velocity or direction, then there must be some other motion besides that of translation; and since all motion may be resolved into the two motions of translation and rotation, there must be in the case supposed a motion of rotation as well.

Now, if the moon had a motion of translation only, every particle of it must describe an orbit similar, equal, and parallel to that of the centre of gravity; and supposing this latter to be a circle, every particle in the moon must describe an equal circle, the centre of such circle being at the same distance from those of the orbit of the centre of gravity that the particle in question is from the moon's centre. Mr. Mushet, and I suppose Mr. Hopkins, will not deny the possibility of such a motion. Nothing would be easier than to represent it. A globe attached to a piece of cylindrical wire, and moving in a circular groove on a table, the sides of the wire being fixed between two parallel pieces of metal always *pointed in the same direction, i.e.* so as always to be parallel to some fixed straight line, would have such a motion. This, mathematicians would call a pure motion of translation. Now, the moon evidently does not move in this way; for (neglecting for the moment the inclination of the moon's orbit to the ecliptic) the *same diameter* of the moon produced always, passes through the earth's centre; and as Mr. Mushet very properly observes, "the nearest and most remote points of the circumference of the moon described two concentric circles in the orbit." But does not it occur to him that the former of these two points describes a less, and the latter a greater circle than the centre of the moon itself? And since these circles are completed in the same time, the former point moves more, and the latter less rapidly than the moon's centre; and, in fact, every point within her will move in a circle, as we shall presently show, whose radius $=\sqrt{a^2+r^2+2ar\cos. \alpha}$, where $a$ is the radius of the orbit of her centre, $r$ the distance of the point from the diameter perpendicular to this orbit, and $\alpha$ the angle which this distance makes with the plane passing through this diameter and the centre of the orbit.

Hence the circles described by the several points in the moon, and therefore their velocities will have all degrees of magnitude lying between those indicated by the radius $a+\mathrm{R}$ and $a-\mathrm{R}$, where R is the moon's radius. In this case of motion, then, *evidently* all the particles have not the same motion. Is this, then, a case of motion of "translation" only? Mr. Mushet answers, Yes. Mathematicians say, No. Now either mathematicians are wrong in calling the first case I have supposed, one of pure translation, or Mr. Mushet is wrong with respect to the actual motion of the moon; or, the same body may have two distinct motions of pure translation, while its centre describes the same orbit. On the first of these suppositions, if the motion be not one of pure translation, what is it? About what axis does rotation take place? On the third supposition, we are driven to the conclusion that scientific terms and definitions are so loose on the most important question of motion, that the same description will include two essentially distinct kinds of motion. This can never be the case. In fact, the mathematical definition of motion of translation being, as I have stated above, there can be but one case of motion of the moon which satisfies it, while the orbit described by her centre is the same; and that is the former of the two cases I have supposed.

The misconception which misleads Mr. Mushet is, that whenever there is motion of rotation about an axis, as well as motion of translation, the orbits of the several particles in the body must be *cycloidal.* Now in the case in which the axis of rotation is at right angles to the orbit, and the rotation takes place in the same time as the revolution in the orbit, each particle will describe a circle, as we proceed to show.

Let $n=\dfrac{2\pi}{\mathrm{P}}$, whence $\pi=3{\cdot}14159$, and P is the moon's periodic time in her orbit round the earth's centre. Then $nt$ will be the angle described by the moon's centre in the time $t$. Let $mt$ be the angle through which the moon has rotated about her axis in the same time; $r$ be the distance of any point in the moon from the axis of rotation; and $\alpha$ the angle which this distance makes with the plane passing through the axis of rotation and centre of orbit when $t=o$.

Take the diameter of the moon's orbit at the same epoch for axis of $y$, and the diameter perpendicular to it for axis of $x$.

Then if $x$ and $y$ are the co-ordinates of the point at the time $t$, and $a$ the radius of the orbit, it is easily seen that

$$x=a\sin nt+r\sin(mt+\alpha)\ldots\ldots..(1.)$$
$$y=a\cos nt+r\cos(mt+\alpha)\ldots\ldots..(2.)$$

If $m$ and $n$ are different, as is the case in the earth, $t$ must be eliminated between these two equations to find the orbit.

If $m=n$, or the rotation and revolution in the orbit be synchronic,

$$x=a \sin nt+r \cos a \sin nt+r \sin a \cos nt,$$

$$=(a+r \cos a) \sin nt+r \sin a \cos nt.$$

Similarly, $$y=(a+r \cos a) \cos nt-r \sin a \sin nt.$$

Whence $$xr \sin a+y\,(a+r \cos a)=[(a+r \cos a)^2+r \sin a^2] \cos nt;$$

or $$xr \sin a+y\,(a+r \cos a)=(a^2+r^2+2ar \cos a) \cos nt.$$

Similarly, $$x(a+r \cos a)-yr \sin a=(a^2+r^2+2ar \cos a) \sin nt.$$

Or squaring, adding, and reducing, we get

$$x^2+y^2=a^2+r^2+2ar \cos a,$$

the equation to a circle whose centre is the centre of the orbit and radius

$$\sqrt{a^2+r^2+2ar \cos a}.$$

If $a=0$, (and $r=R$ the semidiameter of the moon), radius$=a+R$, the radius of circle described by the point furthest from the earth.

If $a=\pi$, radius$=a-R$, the radius of the circle described by the point nearest to the earth.

In this case the same diameter of the moon is always turned towards the earth; and the motion is evidently the same as that which the moon really has. But we have calculated the motion on the supposition that there was a double motion, viz., of translation and rotation. The conclusion is self-evident.

If there be no rotation, then in our equations (1) and (2), we must put $m=o$.

and $$x=a \sin nt+r \sin a$$

$$y=a \cos nt+r \cos a,$$

or $$(x-r \sin a)^2+(y-r \cos a)^2=a^2;$$

the equation to a circle equal to that of the moon's orbit whose centre is at a distance from its centre$=r$.

It is not my intention to remark here on those misconceptions of passages in "Dejere's" letter which give Mr. Mushet an opportunity to show how smartly he can write, but exhibit at the same time how much he requires to learn before he can be considered qualified to correct Sir John Herschel and other celebrated astronomers, who, I fear, in spite of Mr. Mushet, and Mr. Hopkins to boot, will continue to maintain the heresy that the moon has two motions, one in her orbit, and the other about her axis.

It is much to be feared that both of these gentlemen, having *a little*, and *but a little* mathematical knowledge, the proverb concerning which I need not recall to their recollection, and being totally without that diffidence in their own judgment, especially when opposed to the highest authorities, which generally characterises a more profound knowledge, have made those "awkward tumblings" on the astronomical stage, as I fear they will be generally esteemed, which certainly, as brother Jonathan would say, it is a caution to behold.

I will only further remark, that a railway carriage, on a curve, so far from defying rotation, is, by the very arrangement of the outer and inner rails, made to rotate about its centre of gravity. In this case the outer wheels evidently describe a longer path than the inner; and, in fact, the pressure of the outer rails on the wheels, produce an unbalanced force, which does not pass through the centre of gravity of the carriage, causing, according to the fixed principles of mechanics, a rotation about that point. From the mechanical arrangement, this rotation cannot exceed that which is necessary to keep the carriage moving along the rails; but it is no less rotation on that account.

I am, Sir, yours, &c.,

INDAGATOR.

Dec. 28, 1854.

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*To the Editor of the Mechanics' Magazine.*

SIR,—It is extraordinary the number of very intelligent persons I have met with in my time, who could not, from the fact of the same hemisphere of the moon being always presented to the earth, comprehend the inference of the rotation of the moon once on her axis during her monthly revolution. Yet I cannot admit that this misapprehension of the subject is peculiar to practical men, for only in one instance do I recollect of such a person being so misled, and he was soon convinced of his error; but, on the contrary, it appears to me to prevail among those persons, who, not being well grounded in the elementary truths of motion, have not had the advantage of practice and observation to suggest correct ideas on the subject.

I would not, however, have interfered in the discussion of this subject, but that I perceive a tendency to remove it from the domain of practical science to that of mathematics, to overlook the physical truths which it involves, and to refer the whole matter to convenient mathematical dis-

tinctions and fictions, and to an "astronomical theory." Even your correspondent, "Dejere," who is opposed to the error, appears to take this view of the subject, by speaking of it as a "mathematical convention," and "of its being optional to mathematicians to split up the whole motion of a body into two others," as though there were no distinct physical truths on which the matter rested. He thinks also that practical men, and our "engineers generally," are unable to raise their ideas to the height of a "geometrical conception" of an axis, as distinct from that of an axle. Mr. Mushet and the few practical men who agree with him, do, I imagine, contrive to talk of the rotation of men, horses and ladies, without assisting their ideas with the notion of an axle; but, in truth, the question of axis or axle, is an immaterial point in the discussion.

Men conversant chiefly with hard facts, will not be put off with a "mathematical convention," in explanation of truths expressed in language which conveys the idea of positive realities. They will very justly require, as one of your correspondents expresses it, to have communicated to them, referring to rotation and revolution, "an idea of two distinct movements;" and I may add, of two distinct forces also. For this purpose, allow me to give an illustration which I think is new, in addition to those already afforded by your correspondents.

If a hole is bored in any substance, I suppose Mr. Mushet and others, who think with him, will allow that either the boring tool or the matter bored must of necessity rotate on its own axis. Fix then a block of some material to the face plate of a lathe at some distance from the centre, and let it be required to bore a hole in it through the medium of its own revolutions. All we have to do, is to place a boring tool parallel to the axis of the mandril of the lathe, by means of a revolving arm on the back centre, and take care that the tool does not rotate on its axis, which we can effect in the usual manner, as when boring at the centre. But as the shaft of the tool will describe a cylinder in space, the hand will have to follow the movement, as in the case of a winch. The consequence of this arrangement of things, is, that a hole will be bored; but that it can be done without a rotation in addition to a revolution, gentlemen on the opposite side will hardly deny. Two forces are here distinctly manifested, one to produce the revolutions of the block, but which is not great, because it is not opposed; the other to produce rotations of the block whilst preserving the integrity of its parts, in opposition to the resistance of the tool, and in precisely the same manner as though the block was rotating at the centre of the lathe. This latter force is felt distinctly by itself through the hand that holds the tool.

* * * *

A man may move round a table, keeping his face towards the same side of the room as when he began; but if he walks round it in the usual manner, he as much exerts a distinct force to turn himself, as when he turns upon his own axis; in truth, the one is only an expanded case of the other, for he cannot perform the latter feat without describing some small circle. If it be an error to imagine that rotation takes place in a circle as large as a table, will gentlemen be so good as to assign that diameter in a series of smaller circles, in which it becomes a truth? or do they think that the erroneous is metamorphosed by degrees into the truthful, just as in this appeal to the senses, it becomes gradually, and at last, marvellously easy of comprehension, as circles converge to a point, that rotation is truly a fact!

I am, Sir, yours, &c.,

BENJAMIN CHEVERTON.

*To the Editor of the Mechanics' Magazine.*

SIR,

"If the moon always presents the same face to the earth, it does not revolve on its axis at all."—*Mr. Mushet, in "Mechanics' Magazine," page* 538, *col.* 2.

The above assertion may, I think, be proved to be erroneous by the following method, which is so purely experimental that it may easily be reduced to the form of mechanism.

Draw on paper a small circle, C,* or place a ball there, to represent the central body, and let the four dotted lines at right angles to each other be the directions of the four cardinal points of the compass. Place a ship's compass (that is, one that has the card *connected* with the needle) so that the N on its card shall be opposite the end of the dotted line, S, on the paper. When the needle is in a state of rest, without disturbing the needle, move the compass gently along the dotted circle until it comes opposite the dotted line, E. Now, during this operation, the needle and the card attached to it *cannot possibly rotate*, otherwise the polarity of the compass is a mere fable, and the magnetic needle no longer points truly and constantly to the north, variation allowed for. *The needle then, and its card, do not rotate, or revolve on their axis;* yet the point, N, on the card (which represents the moon) no longer faces the central body, C

* We have omitted the diagram which should have accompanied the letter of our correspondent, as his MS. was received late, and his remarks will be readily understood by our readers without it.

(which represents the earth), as it did at S; but a new point of the card does so, marked W. It is needless to waste time in showing that the same thing occurs only in a much more palpable and exaggerated form at N and W. A body, therefore, like the card of the compass, *which does not and cannot revolve on its axis*, does *not*, when revolving round a central body, present the *same* face, but *different faces* to the central body round which it is carried. I do not see how assent to this experimental argument is to be refused, except by denying the polarity of the magnet.

I should not have troubled you with this letter, were it not evident that the above construction may be easily carried out by *mechanism*, and be shown visibly in operation. A very light sphere—and to obtain such a thing would be the only difficulty in forming a machine—might be placed on the centre of the compass-card, and thus a very complete representation obtained of what occurs when a sphere which does *not* turn on its axis revolves round a central body. The object of this communication is to refute the sentence which stands at the head of it. I may add, however, that by the aid of a magnet, and a very small share of mechanical dexterity, the horse traversing a circle, and the regulating-balls of a steam engine, may all be shown to rotate round their axes: many pretty toys might be constructed in exemplification of the fact.

I attach some importance to the controversy going on in your pages; it unveils a little the boasted progress and march of intellect, rather roughly, I will admit; but still we are allowed to get a peep at "science made easy," and a melancholy looking object she is. Melancholy, most melancholy is your own avowal respecting the many letters you have received, all—if containing the same sort of matter as is found in the extract quoted, page 590, at the top—showing a deplorable ignorance of the first principles of reasoning and logic. Is this the result, Sir, one cannot help asking, of education, cheap literature, mechanics' institutions, soirées, lectures, young men's mutual improvement societies, and the like? These things are well. They amuse, they pass the time agreeably, are innocent, and are driving out the grosser vices; but do they teach science, or even the very alphabet of science? Alas! no. The study of science can never be made a matter of amusement, in the common acceptation of that word; the closet, and mayhap the garret, are the places in which science must be pursued; and even there a stern devotion is requisite—a devotion such as instinctively shrinks from the soirée, and the gatherings together where the second-rate hawkers of lectures and thoughts not their own,—and if their own, only so much the more hungry and worthless,—delight to exhibit.

I cannot conclude without expressing my admiration of M. Cherbonneau for acknowledging his error about cutting cogged wheels. This is manly and honourable; it is no disgrace to any one to avow himself mistaken, when he is so. On the contrary, the admission requires an effort that few of us are equal to.

I am, Sir, yours, &c., Z.

P.S.—If the experiment before detailed should be exhibited to young persons, the compass ought first to be placed in different parts of a table, and moved round and round gently, so as not to disturb the needle, to show that the card keeps its position constantly, and never rotates, when handled delicately. The experiment could, in fact, be much more satisfactorily performed by mechanism than by the hand.

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*To the Editor of the Mechanics' Magazine.*

Sir,—My former communication was written in great haste, and I perceive that, in one point at least, I did not express myself very clearly. "Dejere's" correction of a supposed mistake in my statement as to the portion of the surface which would be visible in the second position if there were no rotation, is, in reality, a criticism on the ambiguity of my language. But in the words which he has quoted, I did not intend that A′N was the *exact* portion of the surface thus described on the supposition of no-rotation; and the letters A′N might as well have been omitted, so far as my meaning went. The letter P, being also omitted in the wood-cut (P being the moon's centre) has served to obscure the paragraph in question. Supplying this letter in the figure, "Dejere" will see by the last sentence of that paragraph—viz., "That she has revolved round her axis through an angle equal to a PA′," that I have not made such a mistake as he supposes; this angle being equal to that subtended by his arc *e*N. I must admit, however, that the wording of that part of my letter was ambiguous, and liable to misconstruction; for it might mean either that A′N was *equal* to the portion disclosed (as "Dejere" has interpreted it), or that *a portion of A′N* would be disclosed—which was the meaning I intended.

With regard to Mr. Mushet, I must say that he is rather unreasonable in his complaints about "personalities." A gentleman who makes such wholesale attacks on the rest of the world (saving and excepting Mr. Evan Hopkins) cannot expect to be

treated with any greater deference than he has shown towards Herschel, Laplace, &c.

As to the point in dispute, it appears a hopeless task to argue with a gentleman whose letter shows such a complete want of acquaintance with the very simplest elements of astronomical science. Although it is probably useless to waste any more words on the matter, however, I will merely ask Mr. Mushet one question. In the figure of my former letter (p. 564) can he see that if there be no rotation of the moon round her axis, then any plane section, such as AB, *must remain parallel to itself throughout the whole motion?* If he cannot see this, I have no more to say; if he does see it, I would then ask him whether he sees, as a consequence of this, that we should in that case, perceive portions of the moon's surface in one position which we do not perceive in another? If he sees this—I would ask him, lastly, how he accounts for our *not* perceiving such fresh portions of the moon's surface in different positions of her orbit?

I am, Sir, yours, &c., TYRO.

*To the Editor of the Mechanics' Magazine.*

SIR,—Mr. Mushet's natural ingenuity far surpasses his philosophical acquirements. He is more adroit in putting forth, than in sustaining, pretensions to mathematical knowledge. I am sure your readers will understand why I refuse to answer at length his discursive remarks in your last Number.

I will just add two observations:—1. The moon may, for the purposes of the present discussion, be supposed to be sustained on the summit of a terrestrial mountain, and form part of the earth. Therefore its motion may be considered of the same character as that of St. Paul's, the Nelson Statue, or any similar object. Hence my former remarks. 2. I do not say that "the alleged motion of the moon, *as a material object*, is impossible." I say it is quite possible, and certainly exists. It is true that I dealt with the subject after the manner of mathematicians; but they by no means consider either of the two motions—of translation and rotation—unreal. It should be remembered that on p. 563, "J. C." had given physical illustrations of the subject under consideration, and I did not think it necessary to add others. I will now conclude with the following:—Let a steam-vessel steam in a circle round the Nore Light as a centre; the needle of her compass will, of course, always point towards Shoeburyness, or thereabouts, but her bow will successively point to Southend, the Isle of Grain, Sheerness, the Reculvers, the Mouse, &c., in fact, to every point on the compass-card. To me it appears pretty plain that either the steamer or the needle revolves on its axis. Will Mr. Mushet say which?

I am, Sir, yours, &c., DEJERE.

## SPECIFICATIONS OF PATENTS RECENTLY FILED.

WERTHEIMBER, LEOPOLD, of Paris, France, physician. *Improvements in apparatus for preventing sea-sickness.* Patent dated May 30, 1854. (No. 1199.)

This invention consists in mounting a platform on pistons, supported by steam, in cylinders or in some other such contrivance, the object being to allow a person to stand upon a base which is unaffected by the motion of the vessel.

COLBY, HALL, of New York, United States of America. *Improvements in instruments for taking altitudes, levels, and angles, which he designates "Colby's Altimeter," or self-adjusting quadrant or sextant.* Patent dated May 30, 1854. (No. 1200.)

The inventor describes an instrument for taking altitudes and angles at sea or on land, which is intended to be self-adjusting, and maintain at all times a perfect zenith and horizon in observations taken for latitude and longitude.

LOYSEL, EDWARD, of Rue de Grétry, France, civil engineer. *Improvements in grinding or pulverizing vegetable substances, and in obtaining infusions or extracts from tea.* Patent dated May 30, 1854. (No. 1201.)

The inventor recommends the practice of grinding tea, &c., before it is used, and describes apparatus for grinding such substances, and for weighing them after they are ground; and also a vessel for preparing the ground tea in, in which the water is made to pass up through the tea, &c.

MACFARLANE, JOHN, of Renfrew, manager. *Improvements in steam boilers.* Patent dated May 31, 1854. (No. 1202.)

*Claims.*—1. The use in steam boilers of vertical tapered tubes communicating with the water spaces, and passing through the main flue, and arranged with their small ends downwards. 2. The use in steam boilers of vertical tubes communicating with the water spaces, and formed with an oval transverse section. 3. A mode of obtaining effective tubular heating surface in steam boilers by the use of tubes of oval or differential transverse section, so as to produce a superior over-lapping or enveloping action of the flame and heated current.

DE PENNING, GEORGE ALFRED, of Calcutta, civil engineer. *An appendage to screw propellers.* Patent dated May 31, 1854. (No. 1205.)

A full description of this invention will be given in an early Number.

WILEY, WILLIAM EDWARD, of Birmingham, Warwick, gold-pen manufacturer, and EDWARD LAVENDER, of Birmingham, gold-pen manufacturer. *Improvements in the manufacture of certain kinds of metallic pens.* Patent dated May 31, 1854. (No. 1206.)

This invention consists of certain described methods of connecting the gold and silver portions of metallic pens.

MINIÉ, CHARLES CLAUDE ETIENNE, of Paris, France. *Improvements in projectiles.* Patent dated May 31, 1854. (No. 1208.)

*Claims.*—1. The application to projectiles of a carrier or socket of any suitable shape or material, for the purpose of using projectiles of any diameter less than the bore of the barrel. 2. The application of helical or screw threads to such carriers, or to the projectiles themselves, for the purpose of making the projectiles lighter and applicable to being used in smooth barrels.

MOLINOS, LEON ISIDORE, civil engineer, and CHARLES PRONNIER, civil engineer, both of Paris, France. *Improvements in locomotive steam-engines.* Patent dated May 31, 1854. (No. 1210.)

The inventors provide the fire-box with a hollow bridge, which stands up from the inner end of the fire-bars to near the top of the box, and is intended to turn the flame upwards, and cause it to meet a stream of air, which enters the fire-box through pipes which pass through the boiler, for the purpose of consuming the smoke before it reaches the tubular flues. They also propose to raise the top of the fire-box above the level of the cylindrical portion of the boiler, and to place the steam chamber above the fire-box, for the purpose of increasing the number of tubes.

DUNCAN, DAVID, of Oak Foundry, Crofton, York. *Improvements in railway points, or switches, and crossings.* Patent dated June 1, 1854. (No. 1212.)

The inventor describes a rail which has one side fluted, and the pressure side rolled solid throughout with a base flange on either side, to hold on to the beds of the chairs.

WHITAKER, JOHN, cotton spinner, and JAMES PICKLES, manager, both of Todmordon, York. *Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, and other fibrous substances.* Patent dated June 1, 1854. (No. 1213.)

This invention consists in applying under the beater, a cylinder or roller having projections on its surface, or covered with the ordinary card, and revolving on its axes, so that the projections or card will catch the fibre of the material after it has passed the beater, and give it an additional opening or cleaning, and lay the fibres in a more straight and regular manner than can be done by the beater alone; and also in fixing a brush or cleaner in contact with the said cylinder or roller to keep the teeth or card constantly clean.

ARROWSMITH, JOHN, of Bilston, Stafford, engineer. *Improvements in steam boilers.* Patent dated June 1, 1854. (No. 1214.)

This invention consists in connecting a series of tubular boilers with tubular steam chambers, the said boilers being alternately large and small, the large resting on walls separating the furnaces, and having flues in their interiors, and the smaller being suspended in the furnaces without support underneath them.

KING, CHARLES, and EDWARD SUTTON BENFIELD, both of Chenies-street, Middlesex, wood-carvers. *Improvements in machinery for cutting and carving wood, stone, and other materials.* Patent dated June 1, 1854. (No. 1215.)

"We mount," say the inventors, "a number of revolving cutters in a frame in such a manner that they may be guided over the work in any direction necessary. This cutter frame is so constructed and mounted as not merely to impart the ordinary traverse motions to the cutters and the tracer, but also to admit of the cutters being thrown out of the upright in any direction, and held firmly in an oblique position to produce the undercut."

WESTRUP, WALTER, of Old Ford, Middlesex, mill engineer. *Improvements in the manufacture of wheat into flour.* Patent dated June 1, 1854. (No. 1216.)

*Claim.*—Operating upon wheat in such manner that the interior of the grain or kernel is reduced to grit, or divided into small particles or substances, without being in the first instance pulverized; and the separation of the outer husk or bran from the inner portions of the grain, by a blast or current of air, previous to grinding the same into flour.

CHANCE, JAMES TIMMINS, of the Glass Works, near Birmingham, Warwick. *Improvements in machinery for roughing or preparing the surfaces of glass.* (A communication.) Patent dated June 1, 1854. (No. 1217.)

*Claim.*—Combining apparatus in such manner that glass may be caused to move in an horizontal or nearly horizontal position, and be thereby subjected to the action of pebbles or other substances.

ROBINSON, JOSEPH, of Denton Mill, Carlisle. *Improvements in apparatus for mixing wheat and other grain and matters.* Patent dated June 1, 1854. (No. 1219.)

In carrying out this invention, a long hopper is formed and divided by several

moveable partitions, and at the lower part of it is fixed a fluted roller, with a screw upon it, by the rotation of which a quantity of the contents of each compartment of the hopper, according to its extent, is allowed to escape, and the several quantities come together in a shoot with inclined sides.

ROWLAND, OWEN, of Lloyd-square, Middlesex, gentleman. *An improved apparatus for damping papers, labels, and other like articles.* Patent dated June 1, 1854. (No. 1220.)

A description of this invention was published on page 86 of our current volume.

GREENSHIELDS, THOMAS, of George-street, Derby. *Improvements in railway chairs.* Patent dated June 2, 1854. (No. 1222.)

This invention consists in constructing railway chairs with two bracket pieces, one of which is driven in between the other and the rail, tightening as it goes.

MASCHWITZ, CHARLES, of Birmingham, Warwick, merchant. *A new or improved instrument for paring and slicing apples, potatoes, and other fruits and roots.* (A communication.) Patent dated June 2, 1854. (No. 1223.)

This instrument, which is capable of paring or slicing such fruits and roots as have a nearly spherical figure, is composed of parts so geared together as to give a suitable motion to the root or fruit, which is at the same time acted upon by a knife pressed down upon it by means of a spring.

STRATFORD, BENJAMIN O'NEALE, Earl of Aldborough, of Stratford-lodge, Wicklow, Ireland. *Improvements in locomotion on land and water, part or parts of which are applicable to the raising of weights and the working of machinery.* Patent dated June 2, 1854. (No. 1224.)

This invention mainly consists of certain modifications and adaptations of Lord Aldborough's former patent, dated January 30, 1854, and briefly described on page 162 of this volume.

WHITEHOUSE, EDWARD ORANGE WILDMAN, of Brighton, Sussex, surgeon. *Improvements in effecting telegraphic communications.* Patent dated June 2, 1854. (No. 1225.)

This invention relates principally to the carrying out of certain details of an apparatus patented by Mr. Whitehouse on the 12th of December, 1853.

POOLE, MOSES, of the Avenue-road, Regent's-park, Middlesex. *An improvement in cop-tubes for mules and other spindles, and in machinery for making such cop-tubes.* (A communication.) Patent dated June 2, 1854. (No. 1226.)

This invention mainly consists in the employment of cop-tubes upon mule and other spindles, to receive the foundations of the cop in place of the paper or other quill heretofore in use for the purpose, the same being manufactured out of sheet metal.

WEBSKY, EGMONT, of Wustewaltersdorf, Prussia. *Improvements in bleaching.* (Partly a communication). Patent dated June 2, 1854. (No. 1227.)

This invention consists in keeping linen goods and yarns in continual motion by means of machinery while they are boiled in bleaching liquids.

TAYLOR, ISAAC, of Stanford Rivers, Essex, gentleman. *An improvement in producing thin metallic sheets adapted to printing.* Patent dated June 2, 1854. (No. 1228.)

In carrying out this invention a metallic sheet, suitably prepared by means of several annealings and rollings, is curled upon a mandril having a slot along its length, and which is also recessed at its two opposite sides, and the two approaching edges of the sheet are turned over upon a square edge, each in the direction of the radius of the cylinder when brought together, and are then united.

MASON, JOHN, of Rochdale, Lancaster, machinist, and LOUIS CHRISTIAN KOEFFLER, of the same place, dyer and bleacher. *Improvements in scouring and in washing wool, hairs, and yarns, and in machinery or apparatus for effecting the same.* Patent dated June 2, 1854. (No. 1229.)

These improvements mainly consist in the use of an ascending stream of water passing through the materials after they have been submitted to the scouring liquor, or for operating upon them without the previous use of scouring liquor in the same or another vessel; and in the use of a pump for withdrawing the scouring liquor and returning it to a cistern from which it is drawn.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved fuel.* (A communication). Patent dated June 2, 1854. (No. 1231.)

The inventor adds coarsely-crushed lime to previously prepared char-peat, charcoal, &c., till it is brought to a proper degree of consistence, and then subjects it to powerful compression, and forms it into bricks.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in the construction of umbrellas and parasols.* (A communication.) Patent dated June 3, 1854. (No. 1232.)

This invention consists in constructing a folding umbrella, so that when it is to be opened the covering is first unfolded, the branches opened out and fixed, and the corners of the covering attached to their respective branches by means of small balls, &c.

[illegible], PAUL ARMAND [illegible], of [illegible]-street, London. *Improvements in producing a fabric suitable to [illegible] in [illegible].* (A communication.) Patent dated June [illegible], 1854. ([illegible] 234.)

[illegible] invention consists in the production of a fabric intended to supersede leather [in m]aking card backs, driving straps, &c. The inventor employs an ordinary hand or power-loom, and produces two fabrics, united by means of the weft, [ha]ving a woollen fabric between them.

[illegible]TON, WILLIAM EDWARD, of Chan[illegible]ne, Middlesex, civil engineer. *Improvements in breech-loading fire-arms.* (A communication.) Patent dated June 3. (No. 1237.)

[The] patentee employs a sector-breech [which] does not close up the rear end of the [barrel,] but which is provided with a plug [fitted] to, and which closes and opens the [rear e]nd of the barrel, when the said sector [is fitte]d to and combined with a sector re[cess in] the breech-piece, and with a guard-[l]ever, by means of a link and clamp-[screw], so that the sector-breech is operated, [lo]cked and firmly held during the dis[charge]; and he makes the face of the [breech]-plug concave, with a central projec[tion t]hrough which the touch-hole passes, [for the] purpose of concentrating the fire.

[GO]ODNOW, ABEL FRANKLIN, of New [York,] United States. *An improvement in [scythe] snaths, or the manufacture thereof.* ([A com]munication.) Patent dated June 3, (No. 1239.)

[The] patentee proposes to employ a scythe-[snath] composed of a wrought metal tube.

[GUSTA]VANES, ANTOINE, of Rupert-street, [Haym]arket, Middlesex. *Improvements in [appara]tus for indicating the time a public [carriag]e is, and is not, engaged for hire.* (A [comm]unication.) Patent dated June 3, 1854. ([No. 1]240.)

[The] object of this invention is to register, [by ce]rtain self-acting arrangements, the [length] of time that a carriage is occupied, [and to] show, by means of a plate, raised and [lowere]d by self-acting means, and visible [from t]he outside, whether the carriage is or [is not] engaged.

[BAR]HAM, ALFRED GARRATT, of Bridge-[water,] Somerset, gentleman. *An apparatus [for da]mping or moistening the adhesive sur[face o]f stamps or labels.* Patent dated June [3, 185]4. (No. 1241.)

[Whe]n Mr. Barham's apparatus is used, [the sta]mp or label to be moistened is taken [from a] receptacle provided for it in the ap[paratu]s, and placed upon an upper perfo[rated pl]ate, which being then pressed down [by the] finger upon sponge or piece of felt, [is] forced up and moistens the stamp.

[illegible], JAMES BOWMAN, [illegible] *[illegible] messages by means of [illegible] and [illegible].* Patent dated June [illegible], 1854. (No. 124[illegible].)

The inventor proposes to [illegible] submerged wires and [illegible] balls, plates, or tubes placed on the ends of the battery wires, at opposite sides of the water.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in screw propellers.* (A communication.) Patent dated June [illegible], 1854. (No. 1243.)

*Claim.* The construction of screw propellers with rims on the blades, the said rims being sections of a cylinder having a common axis with the propeller.

CRUM, WALTER, of Thornliebank, Renfrew, bleacher and calico printer, and PETER STEWART, of Thornliebank, mechanical engineer. *Improvements in machinery and apparatus for beetling or finishing woven fabrics.* Patent dated June [illegible], 1854. (No. 1244.)

The inventors use a small horizontal steam-engine whose piston-rod is prolonged at both sides of the piston, and passes through stuffing-boxes at both ends of the cylinder. To each projecting end of the piston-rod is attached a cross piece or pieces, so formed as to represent the ends of a set of ordinary beetles, but forming one compound beetle, calculated to produce by one blow an effect similar to that produced by the successive blows of a number of ordinary ones; and opposite each compound beetle is placed a cylindrical beam, with the cloth wound upon it, so that one of the beetles strikes the beam opposite to it at every advancing and returning stroke of the engine, thereby securing a blow both ways in continuous succession by the direct action of the engine. The usual circular and lateral motions are imparted to the beams on which the cloth is wound by the ordinary mechanical means during the operation.

BORDIER, HIPPOLYTE, of Orleans, France, banker. *Improvements in the manufacture of alcohol.* (A communication.) Patent dated June 6, 1854. (No. 1246.)

The inventor mixes five parts, by weight, of saw-dust, reduced to a fine powder, with six of sulphuric acid, and submits the mixture to an energetic trituration, which gives it a pasty appearance; after this, it stands for twelve hours, and is then diluted with six times its weight of water, and placed in a [illegible] wooden vessel, into which steam is injected by means of leaden pipes. A rapid and continuous ebullition is kept up during eight or ten hours, and the liquid is then

allowed to rest, in order that the particles of wood which are not dissolved may be deposited. The clear liquid is then drawn off, and saturated with chalk, which precipitates the sulphuric acid in the state of sulphate of lime. The pulp or thick paste thus obtained is spread on cloths, to extract the remaining liquid, and the deposit is washed while on these cloths, and submitted to the action of a press. The liquids are then allowed to become cold, and a sufficient quantity of beer, yeast, or other alcoholic agent is added, and the fermentation allowed to operate. Distillation is then effected in the usual manner, and alcohol obtained.

NERON, NAPOLEON, of Rue St. Lazare, Paris, France, gentleman. *Improvements in muskets, carbines, fowling-pieces, and other fire-arms.* (A communication.) Patent dated June 5, 1854. (No. 1247.)

This invention mainly consists in the use of a metal primer, forming a tube, square in its interior and circular on its exterior surface, to contain caps or capsules.

MANIERE, EDWARD, of Bedford-row, Middlesex, gentleman. *Improvements in getting peat, and in manufacturing peat, with other matters, into fuel.* (A communication.) Patent dated June 5, 1854. (No. 1248.)

The inventor employs an apparatus consisting of a screw and case, which, being pressed into peat and caused to rotate, raises the peat into suitable carriages. It is then subjected to pressure, and combined with nitrate of lead, with or without other suitable matters, and moulded as desired.

SPOTTISWOODE, ANDREW, of New-street, St. Bride's, London. *Improvements in the manufacture of fuel.* Patent dated June 5, 1854. (No. 1249.)

This invention consists in the use of rollers for compressing and conveying coal to moulds when brought into a state fit to be pressed into blocks.

BROCKELBANK, LEMUEL, of Willesden, Middlesex. *Improvements in manufacturing lubricating matters.* Patent dated June 5, 1854. (No. 1250.)

The inventor employs "in combination with soap and oil, or fat, the grease or matter which separates from dead or heavy oil on allowing the same to cool and settle."

ALISON, SOMERVILLE SCOTT, doctor of medicine, of Park-street, Grosvenor-square. *The manufacture of a new material to be used for external applications in medicine.* Patent dated June 5, 1854. (No. 1252.)

This invention consists of the use of the skin of the lamb, or other animal, deprived of wool, and prepared according to the chamois-curing process, redressed, and afterwards rendered impermeable to air and water on one surface by the application of caoutchouc or other similar adhesive matter; or simply perforated.

BAILLIE, WILLIAM JAMES, of Southwark, engineer. *An improved mode of propelling ships and other floating vessels.* Patent dated June 6, 1854. (No. 1253.)

This invention consists of a mode of propelling vessels by means of a paddle-propeller, the blades of which, being connected to a rod which is caused always to retain a horizontal position, are made to enter and leave the water in a vertical position.

NICHOLSON, JOHN, of Blackwall, Middlesex, engineer. *An improved ratchet screwing and drilling stock, which may also be used as a spanner.* Patent dated June 6, 1854. (No. 1255.)

This invention was described at length in our last number.

ATKINSON, DAVID, of Seaham-harbour, Durham, printer. *Improvements in printing, and in the machinery or apparatus to be employed therein or connected therewith.* Patent dated June 6, 1854. (No. 1256.)

This invention mainly consists of modes of printing designs or letter-press on a continuous web of paper or other fabric, from "transfers" laid on, or from writing or designs draughted on a cylindrical surface.

MANSFIELD, JOHN, of Stoke, Stafford, engineer and millwright. *An improvement or improvements in steam boilers.* Patent dated June 7, 1854. (No. 1258.)

This invention consists in making the flue, which passes through a steam boiler, "of a helical or corkscrew-like form, that is to say, of a form somewhat resembling the worm of a still."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *An improved manufacture of bonnets and other coverings for the head.* (A communication.) Patent dated June 7, 1854. (No. 1260.)

In this improved manufacture the articles are made principally of leather, paper, or cardboard, ornamented with various devices, and covered with some textile material, such as silk or satin.

WILSON, JOHN, of Albert-place, High-street, Stratford, Essex. *An improved pump, applicable to mines, wells, ships, fountains, and domestic purposes, and raising melted metals in foundries, so constructed that it cannot lose water, draw grit, draw air, or freeze.* Patent dated June 8, 1854. (No. 1262.)

The inventor constructs a pump, the barrel or barrels of which are submerged in the liquid to be raised, that they may escape the ordinary risks of stoppage, &c.

KAYE, JOSEPH, of Beeston, near York, spinner. *Certain improvements in machinery or apparatus for slubbing, roving, spinning,*

*and doubling wool and other fibrous materials.* Patent dated June 8, 1854. (No. 1263.)

The inventor constructs a self-acting "setter on" for mules, billies, or jennies, which may be applied to all kinds of such machines as are worked with a "drawing" carriage. This apparatus dispenses with the "setting-on rod" that stands in front of the creel.

LEADBETTER, JAMES, of Halifax, York, brazier, and WILLIAM WIGHT, of the same place, plumber, and THOMAS DAVIS, of the same place, auctioneer. *Improvements in machinery or apparatus for raising water and other fluids.* Patent dated June 8, 1854. (No. 1266.)

This invention consists in the adaptation of two pistons or buckets working within a cylinder, the one being caused to move at a quicker speed than the other, so as to advance towards it.

BLACKBURN, BEWICKE, of Clapham-common, Surrey. *Improvements in the manufacture of pipes, when applying slate for such purpose.* Patent dated June 8, 1854. (No. 1269.)

The inventor proposes to construct pipes by binding and cementing small slates together in a cylindrical form, the pieces of slates being disposed so as to overlap and break joint with each other, being cemented and concreted with asphalte or other suitable cement.

RICHARDSON, THOMAS, of Portland-place, Newcastle-on-Tyne. *Improvements in the manufacture of alum.* Patent dated June 8, 1854. (No. 1270.)

"This invention consists in manufacturing sulphate of alumina by heating together (in contact with air) alum shale, or other alumina minerals and either artificial or natural pyrites. Also in treating roasted alum shale with sulphuric acid, to obtain sulphate of alumina."

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## PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HARRISON, THOMAS, gentleman, and ELISHA HARRISON, mechanic, both of Blackburn, Lancaster. *Improvements in looms for weaving.* Application dated May 31, 1854. (No. 1203.)

This invention consists in using a beam lever arranged in the side of the shuttle-box, the axis of the lever being in a vertical position, and therefore its movements in an horizontal plane. The end of the lever at the entrance to the box is shaped so as to be forced back (as in the ordinary "swell" arrangement) on the entrance of the shuttle into the box, and the other end of the lever is shaped to form an incline for the picker to act upon.

KENT, JOHN, of St. James's-square, Notting-hill, Middlesex, gentleman. *Improvements in harbour and river boats, and other floating vessels; also in paddle-box boats.* Application dated May 31, 1854. (No. 1204.)

The inventor makes "the bottom and ends of vessels flat, with a slight angle along the centre, or otherwise, with a curve longitudinally, and forms the middle part of the bottom straight, and the ends in curves tangent therewith by continuing the flat bottom up to the gunwale at each end. The sides are flat, straight, and parallel with each other at the bottom, and curved at the gunwale."

ROGERS, ABRAHAM, coal proprietor and miner, Beeston Royds, near Leeds, York. *Improvements in the mode of ventilating mines, sewers, and other subterraneun works, and likewise for warming and ventilating all kinds of public buildings.* Application dated May 31, 1854. (No. 1207.)

The inventor proposes to use the shafts of coke ovens, &c., as ventilators.

BERNARD, JULIAN, of Club Chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture or production of boots, shoes, and other protectors for the feet, and in the materials, machinery, or apparatus employed in such manufacture.* Application dated May 31, 1854. (No. 1209.)

This invention relates to methods of inserting nails or rivets for rendering the articles mentioned more serviceable, and of attaching wooden heels and soles to the other parts by means of any suitable adhesive substance. Also to a novel method of manufacturing boots or shoes, or uniting the different parts together in a partial vacuum.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of manufacturing soluble silicates.* (A communication.) Application dated May 31, 1854. (No. 1211.)

Feldspar or hay is first ground in any desired quantity, and then mixed with caustic lime and soda-ash upon a hard floor or pavement. The compound is then made into a sharp heap and kept wet by daily applications of a shower of water for a month, more or less, when the soluble silicate will be fully formed.

SCHWABE, STEPHAN, of Manchester, Lancaster. *Making sulphate of soda or Glauber's salts.* (A communication.) Application dated June 1, 1854. (No. 1218.)

The inventor takes the refuse produced in the ordinary manufacture of carbonate of soda, or soda-ash, and mixes it with the muriate of soda. This mixture he submits to the action of heat in a reverberatory furnace, and after a lapse of time removes it from the furnace, breaks it up, and puts it

into water, which, after a short time, is run off in the form of a solution of sulphate of soda and evaporated, the salts being left behind.

GEYELIN, GEORGE KENEDY, of Camden-town, Middlesex. *Improvements in furnaces and fire-places for facilitating the consumption of smoke.* Application dated June 1, 1854. (No. 1221.)

"These improvements consist in forming that part of the fire-place or furnace which receives the fuel into a chamber of a cylindrical or other form, capable of rotation or inversion after each fresh supply of fuel, so that the smoke and particles of combustion from the fresh charge may have to ascend through and be consumed by the previously ignited fuel."

WILKINSON, WILLIAM, of Nottingham, framework knitter. *Improvements in stamping, raising, or printing patterns upon leather, textile thread, cut pile, or other similar fabrics, and also for dressing textile, cut pile, and other similar fabrics, previous to the stamping and printing.* Application dated June 2, 1854. (No. 1230.)

This invention relates to the printing of patterns on looped, thread, and cut pile fabrics, and to the stamping or raising of patterns on cut pile and elastic fabrics, and to the rolling, by means of engraved rollers or blocks, of elastic webs into figured webs, &c. &c.

LENOX, THOMAS, of Pigott-street, Limehouse, Middlesex. *A novel mode of reefing topsails, jibs, and other sails from the decks of ships whilst at sea.* Application dated June 3, 1854. (No. 1233.)

This invention consists in reefing or taking in canvass by means of a reef placed on the foot of the sails, which is used in the double capacity of either single or close reef, and worked by means of reef-sheets and tacks leading through cheek-blocks to the deck.

LEPLAY, ABSALON HIPPOLYTE, chemist, of Douvrin, Pas de Calais, France. *Certain improvements in extracting and manufacturing the alcohol of beetroot and of other sweet matters or tubers.* Application dated June 3, 1854. (No. 1235.)

Instead of extracting the juice and fermenting it, and then distilling the liquid, the inventor cuts the beetroot or other substance into small pieces, and ferments and distils it in this divided state.

RENTON, JOHN, of Bond-street, Vauxhall, Surrey, engineer, and HENRY ATTWOOD, of Holland-street, Blackfriars, same county, engineer. *An improvement in the manufacture of starch, applicable in part to the solidifying of colours and other substances held in solution or suspension.* Application dated June 3, 1854. (No. 1236.)

The inventors employ a chamber with an opening at one end, which gauges the size of the block to which the starch is to be moulded, and the other end of the chamber they connect with a force-pump, which supplies the liquid starch. The box is so formed, that as the liquid starch is forced in, the water will find its way through the sides, while the particles of starch will be retained, and accumulate at the end opposite to that at which it entered.

FORETIER, JOHN SAMUEL, of Carlton-hill, Middlesex, gentleman. *Improvements in railway-breaks, and in machinery connected therewith.* (A communication.) Application dated June 3, 1854. (No. 1238.)

This invention consists in constructing certain machinery for working railway-breaks simultaneously, such machinery consisting of a double set of rods extending the full length of each carriage, and connected together at the ends by chains, &c.

GARBERT, GEORGE, of Port Louis, Isle of Mauritius, engineer. *Improvements in the construction of buildings.* Application dated June 5, 1854. (No. 1245.)

This invention consists in combining iron columns with sliding panels in various ways, &c.

SPILLER, THOMAS, of Red Lion-square, Holborn, Middlesex. *Improvements in propelling carriages when atmospheric air is used.* Application dated June 5, 1854. (No. 1251.)

"This invention has for its object a combination of apparatus to collect and condense atmospheric air into a suitable vessel by the movement of a locomotive carriage, and the using of such condensed air when heated as a means of obtaining power, by causing it to act on the piston or pistons of an engine."

PARKES, WILLIAM THOMAS, of Aston-juxta-Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of the ornamental parts of gas fittings.* Application dated June 6, 1854. (No. 1254.)

This invention consists in making the ornaments used in gas branches, &c., of iron.

PERPIGNA, CHARLES ANTHONY, advocate, of Paris, France. *Improved apparatus for effecting the combustion of smoke in fireplaces.* (A communication.) Application dated June 7, 1854. (No. 1259.)

This invention relates to a mode of supplying currents of air to fireplaces by means of pipes.

HINDLE, PETER, of Ramsbottom, Lancaster, manufacturer. *Certain improvements in power looms for weaving.* Application dated June 7, 1854. (No. 1261.)

These improvements consist in the application to power-looms of a small lever or levers, or any suitable substitute for these,

for the purpose of lifting the weights or springs, commonly employed for giving tension to the warp and cloth when used in connection with the cloth roller, so that these weights or springs are relieved at each pick as the weaving proceeds.

ALLDRIT, WILLIAM, of Belfast, Antrim, Ireland, brassfounder. *Improvements in lighting and ventilating.* Application dated June 8, 1854. (No. 1264.)

This invention consists in the employment of a telescopic-tube in combination with the ordinary telescopic gas tube used for suspended gas-chandeliers, for conveying the heated air and gases from above the flame of the gas light through the ceiling, and out to the atmosphere.

SCOTT, MICHAEL, of Great George-street, Westminster, civil engineer. *Improvements in roofing or covering reservoirs or holders for liquids.* Application dated June 8, 1854. (No. 1265.)

"This invention relates to a mode of protecting water-reservoirs from the effects of light, heat, dust, rain, and all extraneous effects or agents, by the use of a peculiar form of floating lid or cover, on the principle of the usual gas-holder."

## PROVISIONAL PROTECTIONS.

*Dated November 9, 1854.*

2377. Ignace Porro, late Colonel of Engineers in the kingdom of Sardinia, director of the Optical and Technomatical Institute of Paris. Certain applications of total or partial reflection of light on transparent surfaces either alone or combined with the refraction.

*Dated November 21, 1854.*

2465. Nicholas Callan, of Maynooth College, Kildare, Ireland, professor. Improvements in exciting agents used in galvanic batteries, and in the construction of galvanic batteries.

*Dated November 23, 1854.*

2473. Charles Crickmay, of the Lozells, Handsworth, Stafford, gun manufacturer. Improvements in single and repeating, or revolving fire-arms, and in the mode of attaching bayonets to breech-loading fire-arms.

*Dated November 25, 1854.*

2491. Richard Roberts, of Manchester, engineer. Improvements in machinery for preparing cotton, and other fibres to be spun.

*Dated December 4, 1854.*

2547. William Thompson, professor of natural philosophy, in the University and College of Glasgow, William John Macquorn Rankine, of Saint Vincent-street, Glasgow, civil engineer, and John Thompson, of Saint Vincent-street, Glasgow, civil engineer. Improvements in electrical conductors for telegraphic communication.

2549. Francis William Russell, of Westbourne-street, Hyde-park-gardens, Middlesex, member of parliament for Limerick. Certain improvements in looms.

2551. James Porritt, of Stubbin-vale-mill, near Ramsbottom, Lancaster, manufacturer. A certain improvement or improvements in carding machines.

*Dated December 5, 1854.*

2553. Thomas Cooper, of the Isle of Wight, Hampshire, brickmaker. Certain improvements in the construction of pipes and in the mode of joining the same.

2555. Cromwell Fleetwood Varley, of Charles-street, Somers-town, St. Pancras, Middlesex. Improvements in producing and applying dynamic electricity.

2557. George Fergusson Wilson, managing director, and John Chase Craddock, superintendent of Price's Patent Candle Company, Bellmont, Vauxhall. Improvements in the manufacture of candles and night-lights.

*Dated December 6, 1854.*

2559. John Warhurst, of Hollingworth, Chester, cotton dealer. Improvements in furnaces or fireplaces applicable to apparatus for heating water and generating steam.

2561. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in coating and colouring metals and alloys of metals. A communication.

2563. John Wyse Mackie, of Edinburgh, Midlothian, biscuit-baker to her Majesty. An improved description of food.

2565. James Anderson, of Dumbarton, North Britain, shipwright. Improvements in bending and shaping angle and bar iron for ship-building and other purposes.

*Dated December 7, 1854.*

2567. Christopher Hodson and James Whitley Stead, of Salford, Lancaster, machine-makers. Improvements in machinery or apparatus for washing or cleansing woven fabrics and clothes, part of which apparatus is also applicable to churning milk and cream.

2569. George Henry Eden, of Birmingham. An instrument for sharpening razors.

2571. James Edward McConnell, of Wolverton, Bucks, civil engineer. Improvements in steam engines.

2573. John Collis Browne, of Weston-super-Mare, Somerset, physician. An improved wrapper applicable as a coat and other covering.

2575. Nathaniel B. Carney, of New York, United States of America. A circular power-loom for weaving circular, cylindrical, and irregular shaped fabrics.

2577. Thomas Metcalfe, of High-street, Camden-town, Middlesex, gentleman. An improved construction of bath chair.

*Dated December 8, 1854.*

2578. Eloi Paulin Castelot, of Lierre, Belgium, refiner. Improvements in decolorising the juices of beetroot, sugar-cane, and raw sugar, and reducing or neutralizing the excess of lime contained therein.

2579. George Aubury, of Queen-street, Edgware-road, Middlesex, and William Richard Bridges, of Gravel-lane, Surrey. A portable apparatus for the manufacture and supply of gas.

2580. Frederic Jolly, of Turton, Lancaster, manager. Improvements in machinery or apparatus for mangling, stiffening, filling, and finishing cotton, and other piece goods.

2581. James Edward McConnell, of Wolverton, Bucks, civil engineer. Improvements in the construction and arrangement of ordnance.

2582. William Hawthorn, of Newcastle-upon-Tyne, engineer. Improvements in safety-valves.

2583. Thomas Brown, of Manchester, Lancaster, silk manufacturer, and Peter MacGregor, of the same place, manager. Improvements in machinery or apparatus for cutting velvets or other similar piled fabrics.

2584. Edward Acres, of Pouldrew Mills, Waterford, miller. Improvements in drying wheat and other grain.

*Dated December* 9, 1854.

2585. John Thom, of Birk-acre, near Chorley, Lancaster, calico printer. Improvements in apparatus for singeing or firing cotton and other fabrics.

2586. Thomas Callender Hinde, of Birmingham, Warwick, merchant and manufacturer. An improvement or improvements in ordnance.

2587. John Cortland, of Wellesley-street, Stepney East, Middlesex. The safety of life at sea or in rivers.

2588. James Higgins, of Salford, Lancaster, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic. Improvements in the manufacture of bayonets, and in machinery or apparatus connected therewith.

2589. George Hale, of Tavistock-street, Covent-garden, Middlesex, boot and shoemaker. Certain improvements in obtaining and applying motive power.

2590. Gustav Adolph Buchholz, of Hammersmith, Middlesex, civil engineer. Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.

2591. Richard James Morrison, of Old Brompton, Middlesex, lieutenant in the Royal Navy. Improvements in propelling ships and vessels.

2592. Reuben Button, of Hackney, Middlesex, upholsterer. Improvements in locks and keys.

2593. Edward Maniere, of Bedford-row. Improvements in lamps. A communication from Monsieur Chatel, jeune, of Paris.

2594. Nathaniel Johnston, of Bordeaux, merchant. Improvements in arranging buildings and apparatus for breeding, rearing, preserving, and carrying leeches. A communication.

2595. Joseph Alfred Nicholson, of Chapel-place, Bermondsey, Surrey. An improvement in the manufacture of dinner and dessert, or table-forks.

2596. George Taylor, of Liverpool, Lancaster, merchant, of the firm of Jacot, Taylor, and Tipper, Water-street. Improvements in regulating the action of governors of steam and other engines. A communication.

2597. William Davis, of the Old Kent-road, Surrey. Improvements in furnaces.

2598. James John King, of Leonard-square, Finsbury, Middlesex, and Thomas Brindley, of the same place, fancy leather workers. Improvements in cigar-cases, card-cases, and other similar cases.

*Dated December* 11, 1854.

2599. François Jacquot, of Bruxelles, manufacturer. Improvements in the lining of hats, helmets, shakos, caps, and similar articles.

2600. William James, of Crosby Hall-chambers, London, iron merchant. Improvements in the manufacture of spikes, bolts, screws, pins, and other similar articles.

2601. Charles Thompson Guthrie, of New Bond-street, Middlesex. Improvements in angles, T-squares, straight edges, parallel rules, and other similar instruments employed in drawing.

2602. William James Harvey, of Exeter, gunmaker. Improvements in fire-arms when revolving barrels are used.

2603. Nehemiah Edward Stevens, of Tunbridge-wells, Kent, architect. A mode of joining or connecting together blocks of stone and other building materials.

2604. William Grindley Craig, of Gorton, Lancaster, engineer. Improvements in railway axle-boxes and spring-fittings.

2605. Isaac Dodds, of Sheffield, York, engineer. Certain improvements in machinery or apparatus for working the slide or steam valves of steam engines.

2606. Edward Taylor Bellhouse, of Manchester, Lancaster, engineer, and Robert Thomas, of the same place, oil-merchant. Improvements in cranes or hoisting-apparatus.

2607. William Bemrose the younger, and Henry Howe Bemrose, of Derby, booksellers, printers, and stationers. Improvements in the mode of and machinery for punching and perforating paper and other substances.

2608. Francis Puls, of Whitechapel-road, philosophical instrument maker. Improvements in electro-galvanic apparatus for medical purposes, part of which improvements are also applicable to other electro-galvanic apparatus.

2609. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved manufacture of conducting wire for electric telegraphs. A communication.

2610. Christian Henry Richard Ebert and Lippmann Jacob Levisohn, both of Old-street, St. Luke's, Middlesex. Improvements in the mode of rendering certain cases or receptacles extensible.

*Dated December* 12, 1854.

2612. George Henry Bachhoffner, of Upper Montagu-street, Middlesex. Improvements in the construction of fireplaces for the better consumption of smoke, and in lighting and maintaining fires.

2613. Timothy White, of Landport, Portsmouth, lead, glass, oil, and colour merchant. Improvements in constructing portable houses, and other buildings and structures.

2614. William Chippindale, of Leeming Bar, near Bedale, and Leonard Robert Sedgwick, of Crakehall, near Bedale, York. Improvements in steam boilers.

## PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2617. John Nesmith, of Lowell, Massachusetts, United States of America, manufacturer. The manufacture of wire netting and wire fence by power. December 13, 1854.

2634. William Charles Day, of the Strand, Middlesex, camp-equipage maker. Improvements in portable camp-bedsteads and bedding. December 14, 1854.

## NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 26th,* 1854.)

1775. John Greaves and Charles Michael Greaves. An improvement or improvements in the manufacture of certain kinds of spectacle frames.

1793. William Johnson. Improvements in furnaces and in the consumption or prevention of smoke. A communication from Edme Lambert, of Troyes, France, merchant.

1795. Charles Cowper. Certain improvements in the felting of hats and in machinery for that purpose. A communication.

1801. Louis Christian Koeffler. Improvements in extracting colouring matter, also applicable for extracting size or glue from animal substances.

1803. Edward Trenery. A new or improved machine for driving piles.

1836. Stopford Thomas Jones. Further improvements to reduce and wash minerals to extract metal therefrom, especially gold.

1829. Thomas Lees. Certain improvements in the mode of lubricating parts of steam engines and of apparatus attached to steam boilers, and in the method of preparing and adapting certain substances for that purpose.

1840. Augustin Jacquelain. Certain improvements in the manufacture of gas for illumination and heat.

1860. Thomas Hayter. Improvements in apparatus for holding straps for sharpening razors.

1861. Hector Grand de Chateauneuf. Certain improvements in the process and apparatus for washing.
1869. William Woodcock. An improvement in the construction of furnaces.
1876. Henry Francis. A machine for scutching flax, hemp, and other like fibrous materials.
1879. Thomas Carr. Improvements in steering apparatus.
1901. William Symington. Improvements in apparatus for heating air by means of steam.
2017. Samuel Cra tre . Improvements in machinery for combing wool, hair, and other fibrous substances.
2259. James Scott. Improvements in apparatus for facilitating surgical operations and teaching anatomy.
2318. Thomas Osborne and William Eldred. Improvements in apparatus for retarding and stoppin railway carriages.
2336. William Charles Theodore Schaeffer. Improvements in treating the waste washwaters of woollen and other mills.
2374. John Halliday. An improved carding machine for the purpose of carding cotton, wool, alpaca, mohair, flax, tow, silk, or any other fibrous material. A communication.
2392. Henry Witthoff. Certain improvements in the construction of boats, ships, or navigable vessels, and in the means of obviating or diminishing the dangers attending accidents to the same.
2436. John Bellamy. Improvements in graining and imitating marble, fancy and other woods.
2457. Richard Knight. Improvements in apparatus for testing iron as to its capacity for receiving magnetism and in magnetic apparatus.
2461. Richard Terrett. An impr ved machine or apparatus for cleaning knives.
2467. Robert Gibson. Certain improvements in machinery for carding wool, flax, cotton, and other fibrous materials. A communication.
2487. William Eley. An improvement in the manufacture of ball cartridg s.
2491. Richard Roberts. Improvements in machinery for preparing cotton, and other fibres to be spun.
2494. Walter Blundell. An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon, for the purpose of totally or partially benumbing the sense of feeling at the desired part of the human body.
2498. Peter Armand Lecomte de Fontainemoreau. Improvements in the manufacture of wrought iron wheels for locomotives or railway or other carriages. A communication from Messrs. I ellassieux, Peillon, and Brothers.
2531. William James Cantelo. An improvement in the construction of barrels of ordnance and small arms, and in balls or projectiles used therewith.
2533. Charles Iles. Improvements in metal bedsteads.
2539. Auguste Edouard Loradoux Bellford. Improvements in apparatus for the manufacture of combustible gas. A communication.
2547. William Thomson, William John Macquorn Rankine, and John Thomson. Improvements in electrical conductors for telegraphic communication.
2549. Francis William Russell. Certain improvements in looms.
2553. Thomas Cooper. Certain improvements in the construction of pipes and in the mode of joining the same.
2557. George Fergusson Wilson and John Chase Craddock. Improvements in the manufacture of candles and night-lights.
2564. Albinus Martin. Improvements in the production of indigo dye colours in dyeing and printing textile fabrics and fibrous materials. A communication.
2570. John Fairrie. Improvements in preparing solutions of sugar for filtration.
2574. Richard Archibald Brooman. An apparatus for regulating tension in spinning-frames. A communication from Hippolite Chaverondier, of Saint Germain, Laval, France.
2575. Nathaniel B. Carney. A circular power loom for weaving circular, cylindrical, and irregular shaped fabrics.
2580. Frederic Jolly. Improvements in machinery or apparatus for mangling, stiffening, filling, and finishing cotton, and other piece goods.
2582. William Hawthorn. Improvements in safety valves.
2591. Nathaniel Johnston. Improvements in arranging buildings and apparatus for breeding, rearing, preserving, and carrying leeches. A communication.
2595. Joseph Alfred Nicholson. An improvement in the manufacture of dinner and dessert, or table forks.
2596. George Taylor. Improvements in regulating the action of governors of steam and other engines. A communication.
2606. Edward Taylor Bellhouse, and Robert Thomas. Improvements in cranes or hoisting apparatus.
2607. William Bemrose, the younger, and Henry Howe Bemrose. Improvements in the mode of, and machinery for punching and perforating paper and other substances.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

## NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council, by John George William Kuper, George Elliott, and Richard Atwood Glass, of Camberwell, Surrey, and Greenwich, Kent, wire rope manufacturers, assignees of the letters patent, granted 8th March, 1841, to John Baptist Fried Heimann, formerly of Ludgate-hill, London, merchant, for improvements in the manufacture of ropes and cables, praying her Majesty to grant a prolongation of the said patent.

On the 1st February, 1855, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to the Committee to fix an early day for hearing the matters contained in the said petition, and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council Office on or before that date.

## WEEKLY LIST OF PATENTS.

*Sealed December* 22, 1854.

1419. Peter Armand Le comte de Fontainemoreau.
1421. James Brunlees.
1422. Henry Sutherland Edwards
1429. Thomas Markland.
1435. Willoughby Theobald Monzani.
1442. Joseph Hulme.

1443. Thomas Richards Harding.
1466. George Daniel Bishop.
1475. Thomas Restell.
1493. William Lacey.
1525. Luke Cooke.
1571. John Livesey.
1603. John Thomas Moss.
1709. Louis Player Miles.
1748. John Livesey.
2064. William Palmer Surgey.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

## NOTICES TO CORRESPONDENTS.

*A Subscriber.*—In his work on the steam engine, Bourne gives the following rule:—"To the temperature of steam in the boiler add the constant increment 459; multiply the sum 'y 11025; and extract the square root of the product. Multiply the length of stroke by the number of strokes per minute; divide the product by the square root just found; and multiply the square root of the quotient by the diameter of the cylinder; the product will be the diameter of the steam passages."



CONTENTS OF THIS NUMBER.



END OF VOLUME SIXTY-ONE.

*LONDON*: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166 Fleet-street, the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.